ČIBUK WIND POWER PLANT, SERBIA

Phase 2 – "Čibuk 2"

Environmental and Social Impact Assessment

Final Report

November 2023

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This document has 431 pages including the cover.

Abbreviations:

AEWA	Agreement on the Conservation of African-Eurasian Migratory Waterbirds
AoI	Area of Influence
BACI	Before-After-Control-Impacts
BCT	Bat Conservation Trust
BGN	Background Noise
BWEA	British Wind Energy Association
C1	Čibuk 1
C2	Čibuk 2
C3	Čibuk 3 or "Cubic"
CESMP	Construction Environmental and Social Management Plan
CHA	Critical Habitat Assessment
CIEEM	Chartered Institute of Ecology and Environmental Management
CLVIA	Cumulative Landscape and Visual Impact Assessment
CMS	Conservation of Migratory Species of Wild Animals
CRM	Collision Risk Model
CRTN	Calculation of Road Traffic Noise (UK)
CTMP	Construction Traffic Management Plan
DTD	Danube Tisa Danube
DESMP	Decommissioning Environmental and Social Management Plan
EBRD	European Bank for Reconstruction and Development
EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
ELC	European Landscape Convention
EMS	Elektromreža Srbije a.d. (Serbian statutory electricity transmission operator)
EP	Equator Principle
EPFI	Equator Principle Financial Institution
ESIA	Environmental and Social Impact Assessment
ESHS	Environmental, Social, Health and Safety
ESMMP	Environmental and Social Management and Monitoring Plan
ESMS	Environmental & Social Management System
EU	European Union
EUROBATS	Agreement on the Conservation of Populations of European Bats
GDG	Guide Development Group
GHG	Greenhouse Gases
GIIP	Good International Industry Practice
GPG	Good Practice Guide
GWL	Groundwater Level
HGV	Heavy Goods Vehicle
IBA	Important Bird and Biodiversity Area
IEA	International Energy Agency
IFC	International Finance Corporation
IFIs	International Financial Institutions
IfNCS	Institute for Nature Conservation of Serbia
IfNCV	Institute for Nature Conservation of Vojvodina Province
IPA	Important Plant Area
IPCC	International Panel on Climate Change
IUCN	International Union for Conservation of Nature

LGV	Light Goods Vehicle
LOF	Landscapes of Outstanding Features
LVIA	Landscape and Visual Impact Assessment
m a.s.l.	meters above sea level
m b.g.l.	Meters below ground level
MoEP	Ministry of Environmental Protection of the Republic of Serbia
NGO	Non-governmental Organisation
NM	Nature Monument
NPC	Nature Protection Conditions
NT	Nearly Threatened (IUCN Red List category)
NSR	Noise Sensitive Receptor
OESMP	Operation Environmental and Social Management Plan
Off	Official
OHL	Overhead Electricity Transmission Line
O&M	Operations and Maintenance
PBR	Potential Biological Removal
PM	Particulate Matter
PPE	Personal Protective Equipment
PS	Performance Standard
PSAWMF	Provincial Secretariat for Agriculture, Water Management and Forestry
RHMI	Republic Hydrometeorological Institute
RS	Republic of Serbia
SAC	Special Area of Conservation, a site designated under EU Habitats Directive and comprising Natura 2000 ecological network
SCADA	SCADA system (Supervisory Control and Data Acquisition)
SEP	Stakeholder Engagement Plan
SNH	Scottish Natural Heritage (now renamed as NatureScot)
SNR	Special Nature Reserve
SPA	Special Protection Area; designated by EU Birds Directive (incl in Natura 2000 ecological network)
SRPS	Serbian Standard
SS	Scoping Study
VEC	Valued Environmental and Social Component (according to IFC’s RCIA guidelines)
VP	Vantage Point (of bird flight activity surveys)
VV	Public Water Management Company “Vode Vojvodine”
WHO	World Health Organisation
WPP	Wind Power Plant
WTG	Wind Turbine Generator
ZTV	Zone of Theoretical Visibility
ZZPS	Zavod za zaštitu prirode Srbije [Institute for Nature Conservation of Serbia]

1 Non-Technical Summary

Čibuk 2 Wind Energy d.o.o Beograd (referred to in this document as “C2WE” or “the Developer”) intend to develop the second phase of the Čibuk Wind Power Plant in Vojvodina Province. The Čibuk Wind Power Plant is located in an extensive area of agricultural land and the owners of the land will continue to farm their plots throughout the operational life of the Project.

As C2WE is likely to seek financial support for the Project from an International Finance Institute or a major commercial bank, they have chosen to adopt Good International Industry Practice in the assessment of the environmental and social impact of the Čibuk 2 Wind Power Plant project. This means that in addition to the regulatory requirements of Serbia, an Environmental and Social Impact Assessment was completed to ensure compliance with the requirements of the Equator Principles and the environmental and social guidelines published by the International Finance Corporation.

This Non-Technical Summary (“NTS”) describes the key findings of the Environmental and Social Impact Assessment of the proposed Čibuk 2 Wind Power Plant (referred to in this document as the “Project” or “Čibuk 2” or the “WPP”). The NTS includes a description of the Project, its location and design, the benefits of the development to Serbia and the region, as well as the mitigation of any potentially significant negative environmental and social impacts identified during the impact assessment.

If you would like any additional information please visit the project website (http://www.cibuk2.rs/) or contact Čibuk 2 Wind Energy at:

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1.1 Context of the Čibuk 2 Wind Power Plant

The first phase of the Čibuk Project has been in commercial operation since April 2019. Čibuk 1 has 57 x 2.78MW wind turbines with a total capacity of 158 MW. Čibuk 1 is currently the largest Wind Power Plant in Serbia and during 2020 the operator (WEBG) exported 368.33 GWh of electricity to the national grid. The second phase of the Wind Power Plant, called Čibuk 2, will add up to 25 more turbines to the scheme, giving a total, maximum capacity of 313MW. The Čibuk site is in Kovin Municipality of Vojvodina Province, about 40 km from Belgrade.

Figure 1-1 Čibuk 1 Turbines

Since the first phase of the Čibuk Wind Power Plant was designed, turbine technology has progressed quickly and the new generation of turbines are bigger and more powerful. C2WE propose to use a 6.1MW turbine for Čibuk 2 which means that the 155MW capacity of the WPP can be achieved with less than half the number of turbines used at Čibuk 1.

At some time in the future, the owner would like to construct a third phase of the Čibuk project ("Čibuk 3") that will add a further 15 turbines. The owner would have preferred to construct Čibuk 2 and Čibuk 3 at the same time but this is not possible as the local transmission network grid does not yet have enough capacity. It is important to note that the Čibuk 3 turbines are within the boundary of Čibuk 2. Figure 1-2 shows the layout and boundary of the Čibuk 2 WPP; the C1 turbines are shown in blue (to the north) and that the C3 turbines are towards the centre of the C2 site.

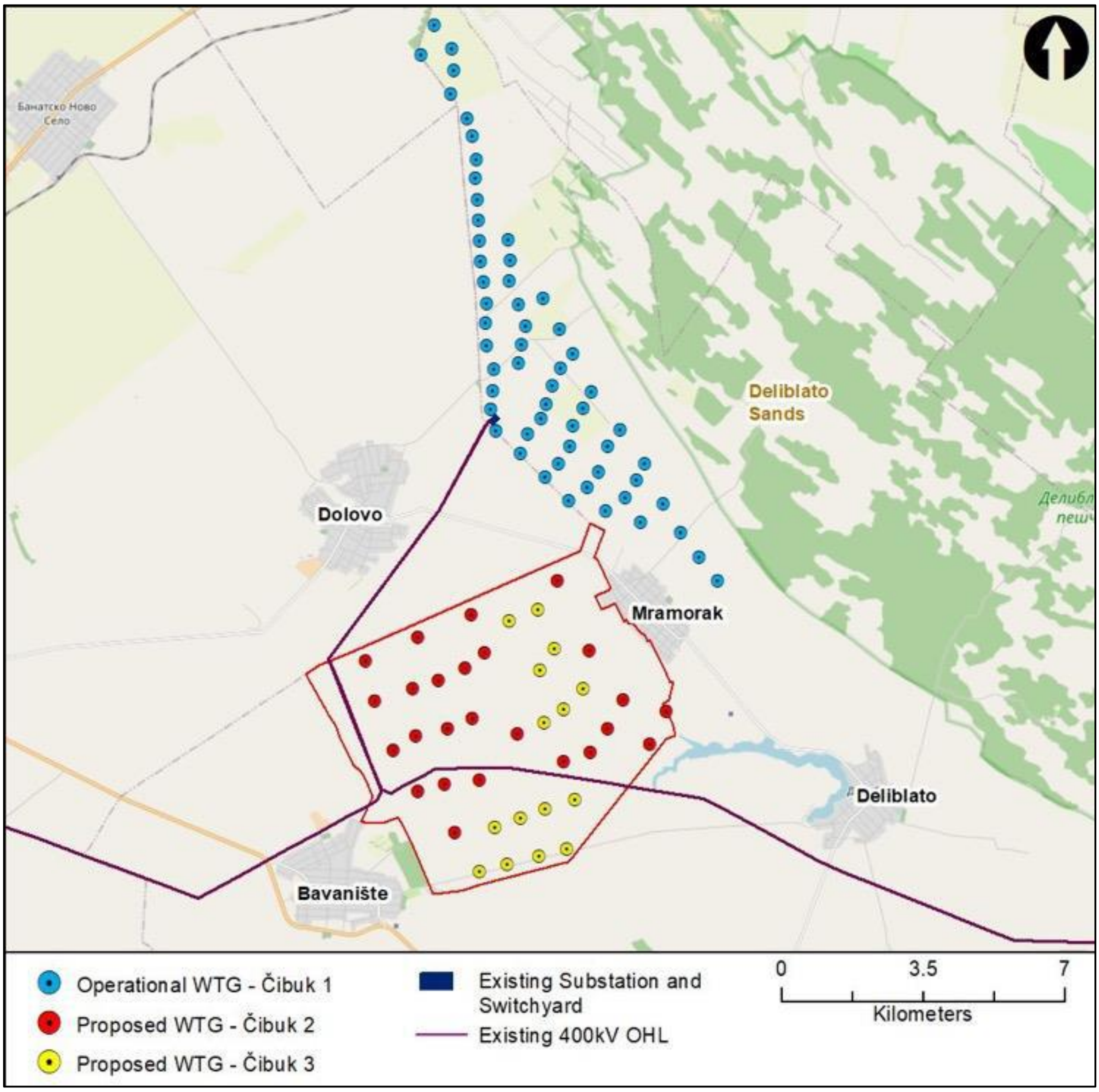

Figure 1-2 Layout of the Čibuk 2 WPP

The Čibuk 2 site is very open, flat and there are several small drainage canals that cross the area. One large main drainage canal runs roughly south to north crossing the central part of the site. These ditches are dry for the majority of the year. Numerous rough tracks also cross the site and they provide access to farm land. These tracks are not surfaced and during the winter months, and following rain, they can only be passed all terrain and farm vehicles.

All of the land within the site boundary is farmed. The main crops are corn and sunflowers. There are no agricultural buildings within the site boundary and only one summer house.

Čibuk 2 will connect to the electricity network using the existing overhead power line. The additional infrastructure for Čibuk 2 will include:

- A small extension to the existing switchyard to allow for the installation of a new transformer.
- A new substation to connect the C2 turbines to the new transformer.
- Access tracks: Upgrading the existing access tracks in order to link the WTGs to the infrastructure on the site. The existing tracks will be surfaced with crushed stone.
- Underground cables: The cables taking power from the turbines to the sub-station will be buried in trenches running alongside the site access tracks. Communication links between each wind turbine, the meteorological mast and the control building/ substation will also be buried in trenches alongside the site access tracks.
- Areas of hardstanding: Each turbine would require a work area to accommodate the crane and turbine components during construction and operation (the “maintenance pad”).

The development of Čibuk 2 will require:

- Lease or purchase of land plots for the siting wind turbines;
- Improvement of existing forest tracks to allow access of construction equipment and then maintenance technicians during WPP operation;
- Clearance of land required for the wind turbine foundations and maintenance platforms;
- Creation of appropriate foundations for the wind turbines;
- Transport of turbine components to the site;
- Installation of the wind turbines using large cranes;
- Construction of appropriate infrastructure including underground power and communication cables, a substation and connection to the main grid;
- Operation of the wind turbines for 30 years; and,
- Replacement or decommissioning of the wind turbines once the WPP comes to the end of its operational life.

1.2 Why is Čibuk 2 Needed?

The Čibuk 2 WPP is the second phase of the Čibuk Wind Power Plant. The purpose of the Čibuk WPP is to generate additional renewable electricity that will be supplied to the Serbian national grid. The Serbian energy sector is very dependent on fossil fuels and the use of reliable, renewable wind power will help Serbia to reduce its use of expensive, polluting fossil fuels. The Project will to the Government of Serbia’s commitment to promote the development of renewable energy projects.

In summary, the Čibuk 2 WPP will:

- Deliver the next stage of an existing wind power plant;
- generate renewable energy that will contribute to national targets for reducing carbon emissions into the atmosphere;
- provide a valuable source of renewable energy for use within Serbia to support infrastructure development and the national building programme;
- strengthen Serbia’s energy sector by helping to diversify its energy sources (which proved to be of great importance after the serious floods in May 2014);
- reduce the need for Serbia to import energy from neighbouring countries;
- generate 430,000 MWh per annum, providing enough electricity to power 150,000 homes;
- displace about 401,190 tonnes of carbon dioxide per year that would be emitted if the same amount of electricity was produced from a coal fired power station;
- reduce the annual emissions from existing coal fired power plant by 12,700 tonnes of sulphur dioxide, 1,470 tonnes of oxides of nitrogen and 512 tonnes of fine dust.

1.3 Project Alternatives

The conditions of the Project site are excellent for wind development and unfavourable for the majority of other renewable technologies. Solar energy could be exploited at the Čibuk site but this would mean the use of a much larger area of land and a significant increase in the loss of agricultural land. The Scoping Study concluded that a renewables project based on wind power generation was appropriate for the region and the site.

1.4 Meeting Serbian Regulations

Serbian EIA regulations require WPP developments of 10 MW installed capacity or over to be subject of an environmental impact assessment procedure. To initiate the Serbian EIA Study procedure, the local authority, in this case the Municipality of Kovin, must develop and adopt a Zoning Plan that includes a basic description of a new project. The approval of the Zoning Plan includes consultation with a series of national and regional statutory bodies that provide their conditions for the development of the Project.

The Zoning Plan is subject to a Strategic Environmental Assessment that has to be approved by the local Municipality. The permits for WPP developments (Location permit, Building permit, Operation permit, Energy permit) are awarded by national authorities.

Once the Zoning Plan has been agreed, the Developer can proceed with a procedure for acquiring the Location Conditions for the project; essentially an environmental permit. The Location conditions ensure that the project can be connected to the existing infrastructure onsite. The Location conditions are provided by the same statutory stakeholders involved in the development of the Zoning Plan.

The Zoning Plan for Čibuk WPP was adopted in June 2021 and defined the wind power plant as comprising 41 wind turbines with a maximum height to blade tip of 240m and a maximum installed capacity of 315MW. A subsequent Strategic Environmental Assessment was approved by the Municipality of Kovin in June 2021.

Once the Zoning Plan was agreed, the Developer were given the Location conditions in July 2022. The Location conditions were issued for Čibuk 2 (but not C3) for maximum installed capacity of 155MW based on 25 turbines. Maximum height to blade tip has been set at 240m, the maximum rotor diameter is 190m, maximum blade length is 95m, and maximum hub height is 160m.

Table 1-1 provides a summary of the E&S conditions in the development permits that directly regulate the construction, operation and decommissioning the Čibuk 2 WPP.

Table 1-1 E&S Conditions in Permits

Permit	Date Obtained	E&S Conditions
Energy Permit	To be obtained	No E&S conditions are set by the permit.
Location Permit	July 2022	**Design/ Pre-Construction:** • The WPP shall comprise up to 25 WTGs, the maximum height to blade tip shall not exceed 240m. • The horizontal distance between two turbines shall be at least one height to blade tip. • Blades must be painted and lighted in line with regulations on obstructions to air navigation. • Any waste dump (e.g. municipal or construction waste) shall be removed from the WPP site. • A minimum 5 metre setback shall be established between the underground cable route and a drainage canal. • Archaeological rescue excavation must be undertaken prior to commencement of the earthworks for foundations of the WTGs No. 1, 8, 12, 18, 33. **Construction:** • Cable trenches and turbine foundations should be properly backfilled to keep out burrowing animals and prevent attracting raptors. • A drainage canal damaged during the construction must be restored to its prior condition.

Permit	Date Obtained	E&S Conditions
		• WTG concrete foundations are not allowed to be built within wetland habitats (bogs, surface-water depressions, swamps, etc.). • Archaeological supervision shall be conducted during the earthworks for foundations of the WTGs No. 7, 11, 16, 19, 22, 23, 25, 27, 28, 31. • In case of chance finds, all work must be immediately halted and the area protected until the Institute for Cultural Heritage in Pančevo secures the findings. • If potentially valuable geological or paleontological features are discovered during the excavation works (e.g. fossils, minerals, crystals), the Developer must notify the national Ministry of Environment within 8 days. **Operation:** • To protect the migratory species, the WPP must be equipped for continual monitoring of bird and bat movements over the site area. • The post-construction bird monitoring must be undertaken for a period of at least 1 year and must be particularly focused on Saker falcon (*Falco cherrug*) and the WPP site area within 1km of the Special Nature Reserve 'Kraljevac Bog'.
Building Permit	Expected in Q2 2023	No E&S conditions are set by the permit. The EIA Study (unconsented) is included in the permit application.
Registration of Works	Expected in Q4 2023	The EIA consent is a prerequisite for the Registration of Works and requires implementation of mitigation measures listed in the EIA Study.
Water Permit	Upon completion of construction (Q1 2026)	The Water Permit will set requirements related to wastewater management during the WPP operation, including any activities which might have an impact on the local drainage canals.

1.5 How Does a Wind Turbine Work?

Wind turbines consist of three main elements: a hollow steel tower, the nacelle, and the fibreglass rotor blades (which are attached to a rotor on the front of the nacelle). The nacelle houses the main mechanical components of the turbine including the generator and the gearbox. The turbine transformer and the main control equipment are in the base of the tower (see Figure 1-3).

The five basic steps of electricity production from wind power plants are:

- Wind turbine blades are turned by the power of the wind;
- the blades turn a rotating generator in the nacelle which converts wind energy to electricity;
- a transformer in the base of the turbine tower increases the electricity voltage for transmission to the substation by underground cables;
- the substation increases voltage for transmission over long distances;
- the electricity is transferred to the grid and distributed to the power users.

The turbine nacelle is rotated by a motor so that the rotor points directly towards the wind. This is in the same way that the sails on a boat are oriented towards the wind by the crew. The direction of the wind is sensed by the wind vane and the wind speed is monitored by an anemometer. The WPP also has a tall mast where the meteorological sensors at mounted. This mast is typically much taller than the turbines.

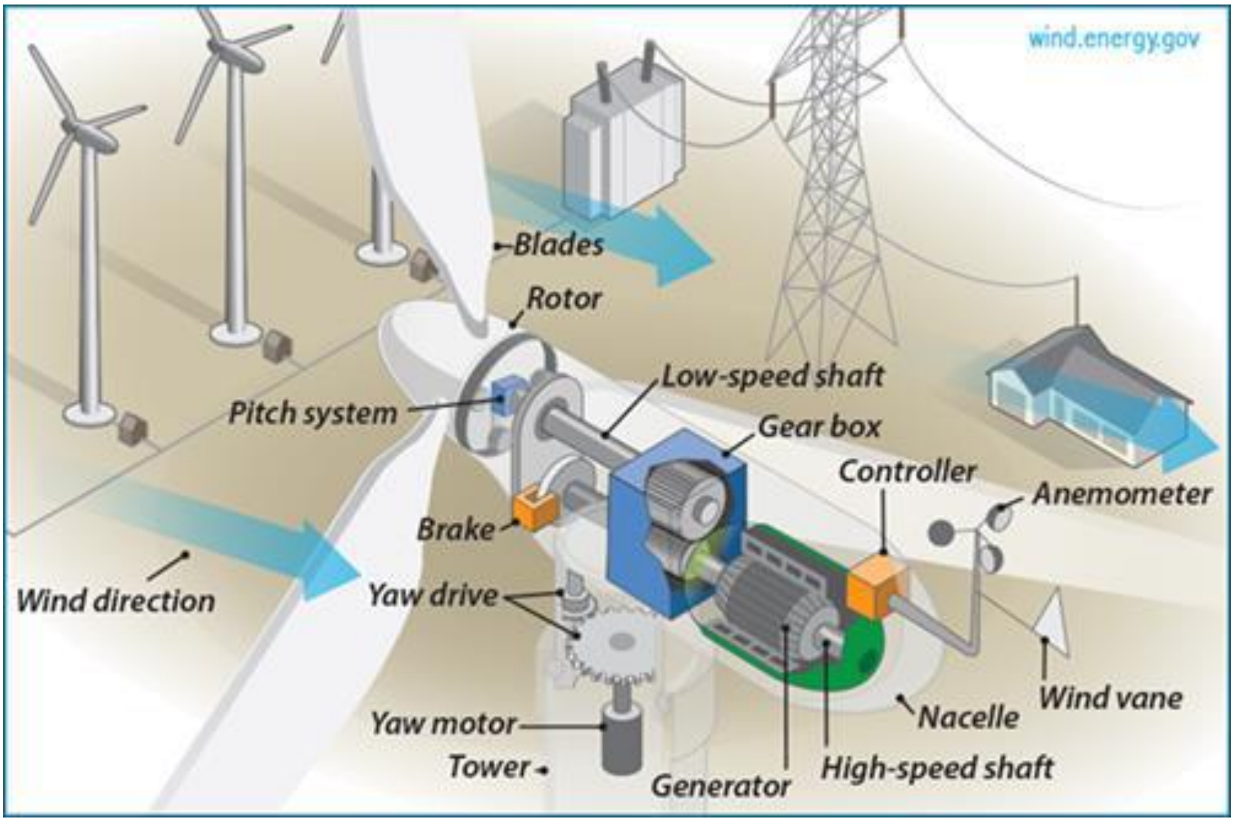

Figure 1-3 Generic Wind Turbine Design

When the wind reaches and maintains constant speeds of over 3 m/s, the turbine blades will start to turn in a clockwise direction. The rotor shaft slowly drives the gearbox that converts the mechanical energy into electrical energy through an electrical generator (which spins at a much higher speed than the rotor).

At a constant wind speed of 3 m/s each turbine will generate about 20kW. At 6 m/s, the output is about 600kW but this rises sharply to the maximum power output at a wind speed of 10 to 12 m/s, when the turbine will generate the design or rated power, 6.1MW in this case.

The pitch control system alters the angle of the blades. This allows the blades to find the best angle, to deliver a safe steady rotation of the blades. The turbine’s electronic controller checks the power output of the turbine several times per second and if the power becomes too high, the pitch mechanism will pitch (turn) the blades slightly out of the wind. Conversely, if the power becomes too low, the pitch mechanism will pitch the blades back into the wind.

At wind speeds above 25 m/s, the turbine blades are stopped by the control systems to prevent excessive wear and tear on the mechanisms. The blades are stopped by rotating the blades on the hub. This change of blade angle means that the blades are no longer driven by the wind; a process called “feathering” the blades.

Most of the electricity produced by the wind power plant will be transferred to the grid but a small amount of electricity is used by the turbines (e.g., the yaw motor and pitch controls) and on-site control facilities.

The basic operation of each turbine is controlled by its’ own computer systems. The operation of the turbines is monitored from a site control room but all WTGs can also be monitored and managed remotely. It is normal for the wind turbine manufacturers to monitor each unit from a central or regional control room. This means that the turbines are monitored continuously, 24 hours per day, 365 days per year.

1.6 Description of the Čibuk 2 WPP

The Čibuk 2 site covers about 4,750 hectares of land which is used entirely for intensively managed agricultural production (mainly corn and sunflower). Importantly, the development of the WPP will take very small areas of land and more than 99% of the land will remain under cultivation.

At the time of writing, the turbine supplier or model had not been selected. C2WE are considering four suppliers, each company has been designing, installing and operating wind power plants for many years. The WTG suppliers currently under consideration are listed in Table 1-2, below.

Table 1-2 Potential WTG Suppliers and Models

Potential Supplier	WTG Generating Capacity (MW)	Overall Rotor Diameter (m)	WTG Hub Height (m)
General Electric (GE)	6.1	158	151
Nordex	5.7	163	107.5
Siemens Gamesa (SG)	6.2	170	165.0
Vestas	5.6	162	125.0

This table illustrates that the WTGs being considered for Čibuk 2 vary in generating capacity and physical dimensions. The GE 6.1MW 158 unit is the preferred WTGs and the ESIA has been based on this unit.

Due to the size of the turbines, it will be necessary to construct substantial foundations. Each WTG foundation is likely to be about 500 m^2 and at least 3.5m deep. Piling may be required for some of the WTG foundations depending on the local ground conditions. The location of the concrete batch plant that will provide concrete for the foundations has not yet been established but it is likely that it will be off-site.

The Čibuk 2 site is crossed by a 400kV power transmission line that runs in an East-West direction (coloured purple in Figure 1-2). This Overhead Line connects to the existing switchyard that serves the C1 WPP. This switchyard is owned and operated by EMS. The Čibuk 2 turbines will be connected to a new transformer by 33(35)kV underground cable. This new transformer will be close to the existing C1 transformers (see Figure 1-4). A new substation will be built for C2 and will connect the new transformer to the EMS switchyard, and then to the national power grid (via the existing OHL).

Figure 1-4 Čibuk Control Building Compound

The C2 control room will be located in the new electrical sub-station. This control room will be staffed from 08:00 to 16:00 from Monday to Friday. The sub-station will include welfare facilities for the WPP operators and the Operation & Maintenance (“O&M”) Contractor.

1.6.1 Site Access

The site will be accessed from the municipal road Dolovo - Mramorak in the north-east and the state road No. 14 and a municipal road near Bavanište in the south. The Čibuk Control Building Compound can be accessed from the village of Dolovo (Detelinska Street).

The existing access tracks will remain open for use by local people and landowners. Where possible, C2WE have positioned the WTGs alongside these tracks. The tracks will need to be upgraded to allow construction vehicles, erection cranes and WTG component delivery. Once the WPP is completed, the tracks will be used by the maintenance teams. No new tracks or access roads will be constructed. The WPP will be provided 57km of upgraded tracks.

1.6.2 Construction

It is C2WE's current intention to appoint an Engineering, Procurement and Construction ("EPC") contractor to build the WPP on their behalf. It is likely that the EPC will appoint one or more separate contractors to undertake the civil work, including the turbine foundations, access roads and crane pads next to each turbine. Specialist contractors would be employed to construct the electrical sub-station and overhead power line to connect the WPP to the grid.

Construction activities will include:

- Surveying of the site.
- Clearance of vegetation for:
  - Construction compound, including equipment and material storage areas.
  - Lay-down areas.
  - New access tracks.
- Upgrading of the site tracks and construction of new access tracks to each WTG.
- Establishment of the construction compound (includes offices, welfare facilities, parking, and secure stores).
- Levelling and excavation (for turbine pads and foundations).
- Installation of electrical infrastructure.
- Cement pouring (mainly for the turbine foundations).
- Installation of the turbines.
- Installation of the new transformer.
- Commissioning the WPP and control systems.
- Landscaping the turbine bases.
- Final surfacing of the access tracks and maintenance pads.

The construction compound is temporary and will be removed following the completion of the construction. This compound will be used for storage of construction machinery, materials and wastes as well as the location for site office and welfare facilities. It will also include an area for worker and visitor parking.

Due to the size of the turbines, it will be necessary to construct substantial foundations. Each foundation is likely to be about 500m^2 and at least 3.5m deep. Piling may be required for some of the turbine foundations depending on the ground conditions. About 1,000m^3 of concrete is required to complete the foundations for each WTG. The supplier of the concrete has not yet been established but it is likely that C2WE use it will be off-site. Steel reinforcement for the structural concrete is expected to be sourced from a local provider but this will be confirmed at a later date. The turbine maintenance pads, which each cover an area of 2,000 m^2. Each pad will be surfaced with compacted, crushed stone. The sand, gravel, and crushed stone obtained locally (Belgrade, Panĉevo or possibly Novi Sad).

The installation of the turbines requires two, or possibly three, large cranes. The biggest crane is transported to the site by truck and assembled on site. A construction pad (of compacted crushed stone) will be prepared at each turbine for the cranes. These pads will remain in place for the life of the WPP and will be available for use by access cranes should any major repair be required to the turbine. The large crane will move under its own power ("crawling") from one to the construction pad to the next. The turbine components will be placed on the construction pad before being lifted into place. The base of the tower is bolted to the foundations. Each tower section is lifted into place and bolted to the section below. The blades may be bolted to the hub before being lifted to the nacelle or may be fixed once the hub is in place; this varies by turbine manufacturer.

The smaller, crawler cranes will be moved from one turbine location to the next along the site tracks. Existing tracks will be upgraded during the initial site preparation work and will connect the turbines and the substation compound. The roads will be constructed to a specification similar to the access road, including roadway preparation, stormwater controls, and placing gravel where needed. Roads connecting the compound to the turbines will be about 4 to 6 m wide, again similar to the access road.

A 33-kV underground power transmission line will be placed in a trench alongside each of the access tracks. These cables will be armoured with woven metal and buried to a depth of about 1m. Excavated material will be used to backfill the trenches.

The supplier of the WTGs has not yet been confirmed but they will be manufactured outside Serbia. It is likely that the WTG components will be brought to Serbia on the Danube River and off loaded at the port of Pančevo. It is likely that the WTG components will be off-loaded from barges docking at the port of Pančevo on the Danube River. The longest option (c. 45km) travels via Banatsko Novo Selo and Vladimirovac. Other shorter options (20-25km long) include the state road from Pančevo to Bavanište, municipal roads and dirt tracks

The turbine components will be transported from Pančevo using oversized road transporters and will comprise:

- Turbine tower sections – Five loads per WTG (top section, middle 1, middle 2, middle 3, bottom section), each transported separately.
- Hub – One load per WTG.
- Blades – Three loads per WTG, each transported separately.
- Nacelle – One load per WTG.
- Drivetrain - One load per WTG.

These convoys will have a police escort and will pass through a number of villages on their way to site. Residents of each village will be given prior notifictation of the date and time of each convoy.

1.6.3 Operation

It is likely that the Energy Permit for the Čibuk WPP will require C2WE to establish and maintain a small team to operate and maintain the WPP. The senior roles likely to be agreed under the Generating Licence are:

- General Manager;
- Operations Manager;
- Maintenance Manager.

The day-to-day responsibility for EHS matters lies with the Operations Manager (OM).

The WPP control room will be in the existing Control Building station. The operation and performance of the turbines will be managed by a specialist team provided by the O&M Contractor. The control room will be staffed from 08:00 to 16:00 from Monday to Friday. The control room team will also operate an out-of-hours standby system to manage breakdowns or emergencies.

The O&M Contractor will also provide continuous monitoring of the WTGs (including any fault or failure conditions) from an off-site Control Room. Should any operational issues arise then the O&M Contractor will try to resolve these from the Control Room and send an information email to their local team in Serbia.

The operation of the sub-station is the responsibility of C2WE, while the Interconnection infrastructure is the responsibility of the Serbian statutory transmission Electricity Supply operator, Elektromreža Srbije ("EMS").

1.6.4 Decommissioning or Re-powering the WPP

The operational life of the WPP is expected to be 30 years; this is the typical working life of a wind turbine blade. As the wind power plant approaches the last few years of operation C2WE will consider the closure or the continued operation of the WPP by replacing the wind turbines (called re-powering). Should C2WE choose to re-power the Čibuk WPP then the turbines could be replaced with new, higher capacity turbines. Re-powering can add another 30 years to the operational life of a WPP.

The decommissioning of a wind power plant is not a complicated process and largely comprises the dismantling of the turbines, removal of the turbine foundations and site clearance. Steel and other useful materials will be recycled. Inert materials that cannot be re-used or recycled will be taken to a suitable landfill.

It is unlikely that the turbine foundations will be removed completely. Instead, the concrete will be demolished and excavated down to a nominal depth of 1m. This will allow for agricultural activities to be undertaken safely once the excavation has been filled with top soil. All temporary roads, areas where the land has been compressed by heavy plant activities, and laybys and temporary platforms will be reinstated.

The sub-station may continue to be occupied, and the transmission line may continue to be used.

There will be no underground electrical cables laid less than 1m deep as, according to the local regulations and the conditions issued to C2WE, the minimum depth for laying the cables must be 1.2m. All electrical cables laid more than 1m deep will be abandoned in place and will not cause any long term significant environmental impact.

1.7 Project Timeline

At the time of writing, the construction timeline is expected to be:

- Start of construction: Q1 2024.
- Site tracks and roads construction: Q1 2024 - Q2 2024.
- Foundations and WTG crane pad construction: Q1 2024 - Q4 2024.
- Construction of the 400 kV connection and switchyard: Q2 2024 - Q2 2024.
- Connection to the existing OHL and grid: Q2 2025.
- WTG installation: Q2 2025 - Q4 2025.

1.8 Preparation of the ESIA

In line with Lender requirements, an ESIA Scoping Study was undertaken in December 2021. The purpose of the Scoping Study was to identify the environmental and social impacts and benefits of Čibuk 2 and to plan the completion of the ESIA.

The Scoping Study indicated that the development of the WPP could lead to a number of environmental and social impacts, both negative and positive. The ESIA considered each impact and proposed a series of design changes and control measures to mitigate the negative impacts. The ESIA was prepared in the summer of 2022.

The impact mitigations and management controls required by this ESIA are summarised in the Environmental and Social Management and Monitoring Plan, or “ESMMP”, and will be delivered within the framework of the Project Environmental and Social Management System. The ESMMP is very detailed and is included in the main ESIA report.

The Scoping Study concluded that the ESIA should consider the following topics in detail:

- Ecology and Nature Conservation – potential impact on birds;
- Ecology and Nature Conservation – potential impact on bats;
- Cumulative Impact;
- Landscape and Visual;
- Shadow Flicker.
- Socio-economic;
- Traffic and Transport;
- Climate Change
- Operational Noise.

In addition, consideration would be given to:

- Noise during construction and decommissioning;
- Archaeology and Cultural Heritage;
- Surface Water and Effluent;
- Land and Groundwater;
- Aviation Safety and Radars Obstructions;
- Electromagnetic Interference and Telecommunication;
- Ecosystem Services;
- Air Quality;
- Community Health, Safety and Security.

1.8.1 Baseline Studies

A series of surveys and studies were planned to obtain the information that would be assessed during the ESIA. A summary of these surveys is provided in Table 1-3, below.

Table 1-3 ESIA Surveys

Key Issues for the ESIA	ESIA Surveys Undertaken
Ecology and Nature Conservation - Birds	Extensive survey work is required over a one-year period to ensure that a sufficient impact assessment and mitigation strategy can be developed within the ESIA. The surveys will include: • Vantage Point ("VP") Surveys, • Breeding Raptor Survey (walkover census), • Breeding Farmland Bird Survey (transects sampling), • Surveys to inform CHA. The VP surveys are designed to quantify the level of flight activity and its distribution over the survey area. Data can also be used to provide an overview of bird usage of the site, which will inform the overview of potential disturbance and displacement. The VP surveys will provide input data for the Collision Risk Model ("CRM"). Breeding Bird surveys will allow the evaluation of occurring population numbers, site's importance and help quantify impacts from disturbance and displacement. A CHA will be undertaken in accordance with IFC PS6/ EBRD PR6.
Ecology and Nature Conservation – Bats	Extensive survey work is required over a one-year period to ensure that a sufficient impact assessment and mitigation strategy can be developed within the ESIA. The surveys will include: • Investigation of roost sites. • Manual bat detector surveys at ground level (transects). • Automated bat detector surveys at WTG locations, • Automated bat detector surveys at height (if mast will be available for installation of the equipment).
Socio-economic	During stakeholder meetings, people were asked about general dependence of the local population on the affected land for livelihood related activities and if compensation which was provided to affected land owners corresponds to full replacement cost.
Landscape and Visual Impact	The landscape and visual assessment were based upon a desk study and field observations. The study area of 30km was used. Zone of Theoretical Visibility models were calculated for the worst-case turbine model. Fieldwork was undertaken to select the relevant viewpoints and take viewpoint photographs as a basis for visualisations.
Shadow Flicker	A Study Area of ten rotor diameters (1,700m) around each proposed turbine was considered. The shadow flicker model was developed using WindPro software. A field survey was undertaken to inspect the receptors predicted to be affected by more than 30 hours of shadow flicker per year.

Key Issues for the ESIA	ESIA Surveys Undertaken
Traffic and Transport Impact	A desk-based assessment of transport and traffic impacts was completed to: • establish the baseline traffic conditions along the route, • estimate the traffic levels likely to be generated during the construction phase, • conduct qualitative assessment of potential impacts, and • propose control and mitigation measures.
Operational Noise	A two-week baseline noise survey was undertaken at five representative locations which were representative of the nearest houses in the Mramorak, Dolovo, Bavanište and Bavanište Monastery. Two locations are chosen for Mramorak. The survey was undertaken in combination with anemometry measurements to determine the wind speed. The survey considered the range of wind speeds and wind directions during both daytime and night-time periods.

1.9 Potential Benefits and Impact of the Čibuk 2 WPP

The Čibuk WPP site was chosen due to the excellent wind resources, agricultural use of the whole site land and because the site is crossed by a 400 kV overhead power line. The Developer plans to extend the existing switchyard (adding a new transformer) and there is no need to construct a new overhead line to connect the WPP to the national power grid. Importantly, the development of the WPP will take very small areas of land and more than 99% of the land will remain under cultivation.

1.9.1 Generation of Renewable Electricity

The primary purpose of the Čibuk WPP, and other WPP projects in South Banat, is to reduce the national reliance on fossil fuels, in particular national coal resources and the import of natural gas. The Čibuk 2 WPP will generate about 155 MW; enough to power 150,000 homes.

The Čibuk 2 WPP will generate about 430,000 MWh of renewable energy each year and will displace about 401,000 tonnes of carbon dioxide during every year of its operation.

1.9.2 Land Take

The land required for the turbines and roads is very low and only 0.2% of the arable land within the site will be lost to the WPP infrastructure. In total up to 10 ha of land will remain permanently unavailable for agriculture after construction.

1.9.3 Habitats and biodiversity

The Primary Mitigations proposed by the ESIA, and adopted within the Zoning Plan, has ensured that almost all potential negative impacts of the Project on ecological features are avoided or significantly reduced.

The ESIA concludes that, provided that the recommended mitigation measures are delivered:

- The construction of the WPP will have no significant impact on local or regional bird and bat species, although a European Bee-eater nesting location that will be lost will be replaced on site.
- the operation of the WPP will have no impact on any designated site, habitat, flora or fauna populations;
- the operation of the WPP will cause some disturbance to bird activities and the ESIA concludes that there will be negligible impact;
- the operation of the WPP is likely to have a minor impact on six bat species.

WTG operation will cause some disturbance to bird activities, though this cannot be considered displacement for most species and **no** impact can be ascertained. Detailed assessment of sustainability of several species populations of significant conservation value and potentially susceptible to displacement, undertaken as a precaution, clearly indicate that there will be a **negligible** impact at the most on the regional populations of Common Quail, Hen Harrier, Saker Falcon, and Tawny Pipit.

Some bird collision fatalities from WTGs are inevitable over the operational life of the WPP. The collision risk assessment and assessment of sustainability of the potentially affected populations concludes that there will be a **negligible** impact on the regional populations of Western Marsh Harrier, Hen Harrier, Common Buzzard, European Bee-eater, and Saker Falcon. The remaining species observed within the WPP site are considered not susceptible to collision mortality or of insignificant nature conservation value, or occur at the site only incidentally. Although incidental single collision fatalities of these species as well cannot be completely excluded, such a low (potential) additional mortality could not affect their populations even at the site level, and **no** impact can be ascertained.

Some bat fatalities from operational WTGs are inevitable. The impact on the majority of occurring bat populations from mortality caused by operating WTGs is assessed as **none**. The assessment of sustainability of the potentially affected populations concludes that the impact on the highly susceptible species regional populations, the Soprano Pipistrelle Bat, Kuhl's Pipistrelle Bat, Nathusius' Pipistrelle Bat, Parti-coloured Bat, Leisler's Bat, and Noctule Bat, including resident and migratory populations of Leisler's Bat and total population of Nathusius' Pipistrelle Bat of significant conservation value, is **likely negligible**, and, as a precaution, ***possibly low negative regional***. WTGs in the areas of established foraging areas and commuting routes of these species have been identified as potentially the most harmful are numbers 33, 25, and 22.

Between one and three years of post-construction bird and bat monitoring and mortality surveys will be undertaken in accordance with international best practice.

1.9.4 Socio-economic

Socio-economic impacts related to the construction phase are all assessed as having **minor significance**. Negative impacts include those in relation to land use, as up to 10 ha of arable land will be occupied during construction, and possible damages of crops or to road surfaces. All other impacts are **positive** and they are in relation to the creation of employment and procurement opportunities, causing further positive impacts on local livelihoods, as well as in relation to the upgrading of access tracks, enabling local land owners to access their land with more efficient agricultural machinery. The positive impacts are mostly short term and of a local character.

Following proposed mitigation measures, the residual impact rating for the key negative construction related impacts is reduced to negligible.

The most significant socio-economic impact during the operation phase is **moderate beneficial** and is in relation to revenue generation for the municipality and donor support for local initiatives. Minor beneficial impacts are expected as a result of regular maintenance of access tracks used by local owners of land. All other impacts are negligible, including any possible economic displacement of users of land if they suffer any losses. The positive impacts are mostly long term and all impacts are of a local character.

1.9.5 Landscape and Visual

The large-scale, open and flat landscape is considered to be a good location for the proposed WPP. The turbines will dominate the landscape up to 2km from the site, and are expected to create a **major to moderate adverse** impact. As the distance from the site increases, the turbines would appear less prominent in the vast, flat landform, reducing the impact significance to **minor to negligible adverse**.

The Čibuk 2 turbines would be clearly visible and prominent in the view from a limited number of houses on the eastern edges of Mramorak, southern Dolovo, and northern and eastern Bavanište and it would constitute **major adverse** impact significance. Due to vegetation and buildings, many views within the villages would be obstructed or limited to upper parts of turbines resulting in a **moderate adverse effect**. From more distant views within a 5km radius (Dolovo, Bavanište, Deliblato) the incremental visual effect compared to the existing situation with the Čibuk 1 WPP would be medium to low adverse, resulting in a **moderate to minor adverse effect**. From more distant settlements (Kovin, Skorenovac, Gaj) the turbines will be visible from houses on the edges of the settlements, but not prominent and not significant.

The primary mitigation is embedded in the design of the proposed WPP. No specific landscape enhancement measures are proposed. Mitigation planting should be with native species, suitably protected, maintained and monitored during medium-term establishment for a minimum of 5 years upon completion of the proposed Čibuk 2 WPP.

Bespoke mitigation planting may be considered near a small number of houses in the east (Mramorak), north-west (Dolovo), and south-west (Bavanište) where there would be an open view of the turbines at a distance of less than 2km. Specific consultation should be undertaken with the effected people and where possible, targeted screening by woodland planting should be considered.

Provided that mitigation planting is successfully implemented, the significant adverse landscape and visual effects will be reduced to the acceptable level - **moderate to minor adverse**.

1.9.6 Shadow Flicker

The shadow flicker assessment indicated that the potential to exceed the worst-case threshold of 30 hours per year could be exceeded at 4 permanently occupied houses on the south western edge of Mramorak village. These residential houses are predicted to experience between 31 and 35 hours of shadow flicker per year from C2 WTG No. 22. Also, there are 4 permanently occupied houses in the same area where the amount of shadow flicker is predicted to be just higher than the daily threshold of 30 minutes. The effect will occur from November to February between 3pm and 4pm.

In addition, four residential houses in northern Mramorak are predicted to be impacted by the cumulative shadow flicker with the Čibuk 1 and Vetrozelena WPPs.

The assessment was based on a conservative estimate and no account was taken of typically less sunlight in winter months and existing screening features. It is therefore considered that the actual amount of shadow flickering is likely to be much less.

For the permanently occupied houses (highly sensitive receptor) the shadow flicker impact is thought to be significant **- moderate adverse effect**.

For the affected industrial and agricultural buildings as receptors of low to negligible sensitivity, the impact is not thought to be significant - **negligible adverse effect.**

To mitigate the effects of shadow flicker a number of mitigation options are available. There is no universal solution applicable to all receptors and some measures would be possible only with cooperation of the affected people. However, all mitigation measures can be applied or adjusted at the WPP operational phase. Provided that any potential shadow flicker effects can be mitigated through the implementation of the Shadow Flicker Management Plan, no significant residual effects are predicted during the operation of the proposed Čibuk 2 WPP.

1.9.7 Traffic and Transport

The transport of general construction material for Čibuk 2 would contribute to a negligible increase (between 7 and 18%) in HGVs movements along the 25km-long route between Pančevo and the WPP site. The potential impact on traffic and transportation would be temporary and short-term, with **negligible adverse** with **moderate adverse** significance impact on severance, driver delay, pedestrian delay and amenity.

The transport of turbine components is assessed to be a temporary change of a low magnitude and a **minor adverse** significance impact.

A Construction Traffic Management Plan (CTMP) should be developed in consultation with Roads of Serbia, Traffic Police Department in Pančevo and the municipality of Kovin.

Potential residual impacts would likely be minor driver delays as a result of temporary road closures or slow movement of HGVs. Increase of traffic flows of heavy vehicles would add to the risk of road wear and tear. No significant residual impacts are anticipated during the construction transport for the project.

1.9.8 Operational Noise

The assessment has indicated that all locations can meet the Serbian daytime and night-time noise limits. However, the properties at the two closes settlements will exceed the IFC night-time noise limits based on the background noise. However, at a small number of properties in Mramorak and Bavanište the predicted noise levels will exceed the IFC night-time noise limit. This exceedance is due to the existing low background noise levels at night. At Mramorak (but not Bavanište) the predicted exceedance at some locations is also due to a contribution from Čibuk 1 WTGs. However, it will be possible to meet the limits by running certain turbines in low noise modes at night.

Following proposed mitigation, the residual impact rating for the key impacts identified are **minor adverse**.

Other WPPs are proposed in the area including Vetrozelena which has turbines all around Dolovo and closer to it than Čibuk 1 and Čibuk 2. The Vetrozelena turbines are expected to have a greater impact on the residents of Dolovo than the Čibuk turbines.

1.10 Stakeholder Engagement Plan

An initial Stakeholder Engagement Plan ("SEP") was prepared at the same time as the Scoping Study. The purpose of the initial SEP was to identify, and then guide the consultation, with project stakeholders. The key stakeholders were invited to contribute their views on the project and to provide any information that they considered would be important in the preparation of the ESIA. It is noted here that WEBG already has a very strong relationship with local stakeholders which was developed during the construction and operation of the Čibuk 1 project.

The Čibuk 2 SEP includes the following information:

- Public consultation and information disclosure requirements according to national legislation and international requirements;
- identification of stakeholders and other affected parties;
- overview of previous engagement activities carried out for the project;
- future stakeholder engagement programme including methods of engagement and resources; and
- a grievance mechanism that can be used by stakeholders to record and manage complaints, concerns, queries and comments.

The SEP is a "living document" and will be reviewed and updated throughout the construction and operation of the wind power plant. The latest updated version of the SEP is available on the WEBG website (http://www.teslawind.rs/en/). All stakeholders are invited to read, and comments upon, the SEP if they wish. Reports from various stakeholder engagement activities are also available on the company website.

At the end of each year, an appendix will be added to the SEP which describes the stakeholder events that were held, comments made by the attendees, and a summary of any grievances raised during the year.

The initial SEP identified the key stakeholders as the residents of the municipality Kovin, in particular the villages surrounding the project site, Mramorak and Bavanište, as well as Dolovo which territorially belongs to the City of Pančevo. In addition, stakeholders included any people that may have been affected by land acquisition, active civil society organisations, representatives of relevant municipal departments and institutions, as well as other statutory stakeholders.

--------- End of the NTS ---------

2 Introduction and Context of the ESIA

Čibuk 2 Wind Energy d.o.o Beograd (referred to in this document as "C2WE" or "the Developer") intend to develop the second phase of the Čibuk Wind Power Plant in Vojvodina Province, in the north east of the Republic of Serbia. The Čibuk Wind Power Plant is located in an extensive area of agricultural land and the owners of the land will continue to farm their plots throughout the operational life of the Project.

The first phase of the Čibuk Project (referred to as "Čibuk 1" or "C1") has been in commercial operation since April 2019. Čibuk 1 comprises 57 x 2.78MW wind turbines and has a total capacity of 158 MW. Čibuk 1 is currently the largest WPP in Serbia and during 2020 the operator exported 368.33 GWh of electricity to the national grid.

The development of the Čibuk 1 Wind Power Plant ("WPP") was completed in line with IFC guidelines and standards as well as local regulations and permit requirements. The C1 WPP has been welcomed by local stakeholders, has been shown to have a low environmental impact and is commercially successful.

The second phase of the WPP, Čibuk 2 ("Čibuk 2" or "C2") will have a maximum installed capacity of 155MW. The Čibuk 2 turbines will be installed on the south-western boundary of Čibuk 1. Since the first phase of Čibuk 1 Wind Power Plant was designed, turbine technology has progressed quickly and the new generation of turbines are bigger and more efficient at generating electrical energy. C2WE propose to use a 6.1MW turbine for Čibuk 2 which means that the 155MW capacity can be achieved with a maximum of 25 turbines; less than half the number installed at Čibuk 1.

In due course, the owner intends to construct a third phase of the project ("Čibuk 3") that will include an additional 15 turbines. The owner would have preferred to construct Čibuk 2 and Čibuk 3 as a single unit but this is not possible due to constraints in the local transmission network grid. It is important to note that the Čibuk 3 turbines are within the boundary of Čibuk 2.

The Zoning Plan was adopted in June 2021 and allows for the construction of up to 41 WTGs with a maximum total installed capacity of 315 MW. The Zoning Plan application was based on the installation of 7.5 MW turbines. C2WE propose to construct no more than 40 turbines (up to 25 turbines at Čibuk 2 and up to 15 at Čibuk 3), each with a nominal capacity of 6.1 MW. The Zoning Plan provides the planning framework for both C2 and C3.

As it cannot be confirmed when Čibuk 3 will be developed, this Scoping Study and the subsequent Environmental and Social Impact Assessment, will focus on Čibuk 2. However, as there is a firm intention to develop Čibuk 3, this ESIA has considered Čibuk 3 as part of the cumulative impact assessment. The environmental and social impact of Čibuk 3 will be considered prior to development. Čibuk 2 and Čibuk 3 will be the subject of separate EIA under Serbian law.

As Čibuk 2 Wind Energy d.o.o. is likely to seek financial support for the project from an International Finance Institute or a major commercial bank, they have chosen to complete an Environmental and Social Impact Assessment ("ESIA") in compliance with the requirements of the Equator Principles. The ESIA Scoping Study was completed in December 2021 and a full programme of bird and bat surveys was initiated at the beginning of March 2021. It is noted that the Serbian EIA has been prepared by the ESIA consultants to ensure continuity between the two documents; the EIA was based upon the survey data and findings of the ESIA.

2.1 Need for the Project

The Čibuk 2 WPP is the second development phase of the Čibuk Wind Power Plant. The first phase of the Čibuk Project (Čibuk 1) has been in commercial operation since April 2019. The primary purpose of the Čibuk 2 WPP is to generate additional renewable electricity that will be supplied to the Serbian national grid.

The Republic of Serbia is party to the Energy Community between the EU and South-East European countries. Serbia is therefore obligated to adopt an implementation plan of the Directive 2009/28/EC (to be repealed by the Directive 2018/2001 on 1 July 2021) for the promotion of renewable energy sources.

The proposed Čibuk 2 WPP will:

- Deliver the next stage of an existing wind power plant;
- generate renewable energy that will contribute to national targets for reducing carbon emissions into the atmosphere;

- provide a valuable source of renewable energy for use within Serbia to support infrastructure development and the national building programme;
- strengthen Serbia's energy sector by helping to diversify its energy sources (which proved to be of essential importance after the unprecedented floods in May 2014);
- reduce the need for Serbia to import energy from neighbouring countries;
- reduce the country's reliance on fossil fuel combustion;
- generate 430,000 MWh/per annum, providing enough electricity to power 150,000 homes;
- displace about 401,190 tonnes of carbon dioxide per year that would be emitted if the same amount of electricity was produced from a coal fired power station;
- reduce the annual emissions from existing coal fired power plant by 12,700 tonnes of sulphur dioxide, 1,470 tonnes of oxides of nitrogen and 512 tonnes of fine dust.

2.2 Project Location

The Čibuk WPP is in a rural Kovin Municipality of Vojvodina Province (north-east Serbia), about 40 km from Belgrade. Vojvodina, and South Banat in particular, is predominantly flat with occasional gently undulating areas. The area is dissected by canals and roads, and has been intensively farmed for many decades (Figure 2-1). The State border between Serbia and Romania is about 40km to the east, see Figure 2-2.

Figure 2-1 Typical Landscape of South Banat

The site lies between the small villages of Bavanište and Mramorak. The village of Dolovo is a few kilometres to the north and Deliblato a few kilometres to the south-east, see Figure 2-2.

Whilst the area is largely agricultural there are two small biogas plants (1MW each) just north-east of the site and a brick (clay block) production facility just south-west of the site.

A paved road runs close to the site northern boundary, connecting the villages of Dolovo and Mramorak. Numerous rough tracks also cross the site and they provide access to the farm plots. These tracks are not surfaced and during the winter months and following rain are often impassable to anything but farm vehicles. A disused railroad runs along the southern boundary of the site.

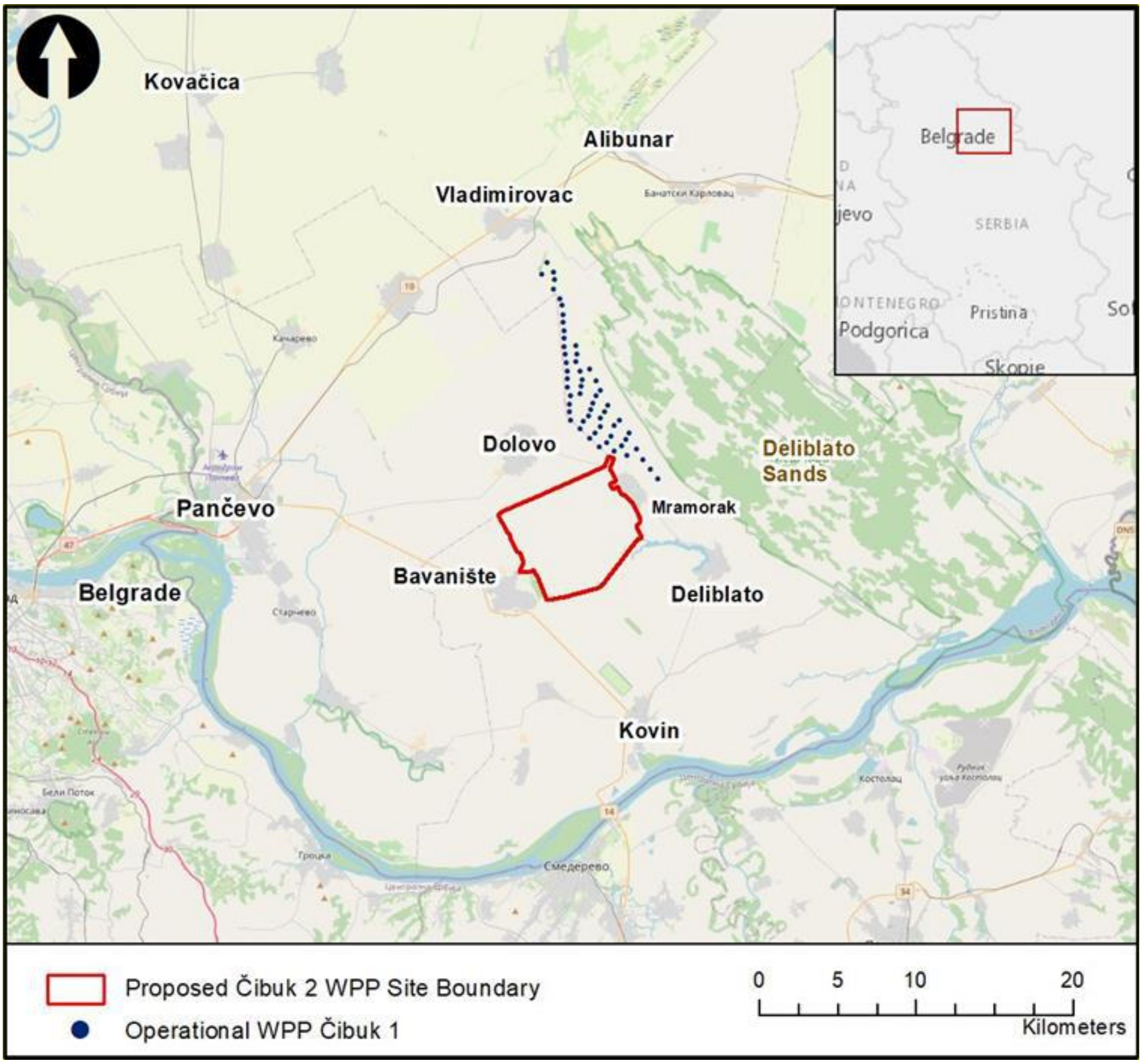

Figure 2-2 Project Location

The Čibuk site was originally selected for the development of the WPP in 2010 as:

1. This north eastern part of Serbia has a significant wind resource. A recent study undertaken by Vattenfall confirms an average wind power for the area in excess of 300 W/m^2 (at 100m a.g.l) and the average annual wind speeds are over 6 m/s. This wind resource is considered economically viable for wind development. This is one of the highest in Serbia, see Figure 2-3 (the location of the Čibuk site is circled in red).
2. Presence of good transport links (municipal roads travel north, east and south of the site) and proximity to a well-developed electrical distribution network. The Overhead Line running to the south-east of Dolovo is the interconnector from the Čibuk 1 transformer station to the 400 kV OHL. A new transformer station will be constructed for Čibuk 2 adjacent to the Čibuk 1 Control Building compound (the plot has been acquired). Both the Čibuk 1 and Čibuk 2 WPPs will connect to the national electricity grid via the existing OHL and the construction of a new OHL will not be required
3. The C2 site is outside local settlement zones. A conservative separation distance of 1 km from populated areas has been complied with. Occupied properties on the outskirts of Bavanište and Mramorak are at least 1 km from the C2 site boundary. This separation distance will minimise any potential impact of the WPP on the local population from noise, visual amenity and shadow flicker.
4. The land to be occupied by the C2 turbines is currently used for agricultural production. The land is accessible and the terrain is suitable for the construction of a large wind power projects. The development of the WPP will take very small areas of land and more than 99% of the land will remain under cultivation.

5. The land within the WPP site is under intensive agriculture and the ecological value of the site is low.
6. The C2 site is within the recently designated (2021) Južni Banat (South Banat) International Bird Area. This IBA is not "strictly protected" from development and the development has been approved within the Zoning Plan. The habitats within the Project site are considered to be of poor quality to local fauna given the intensively farmed monocultures.

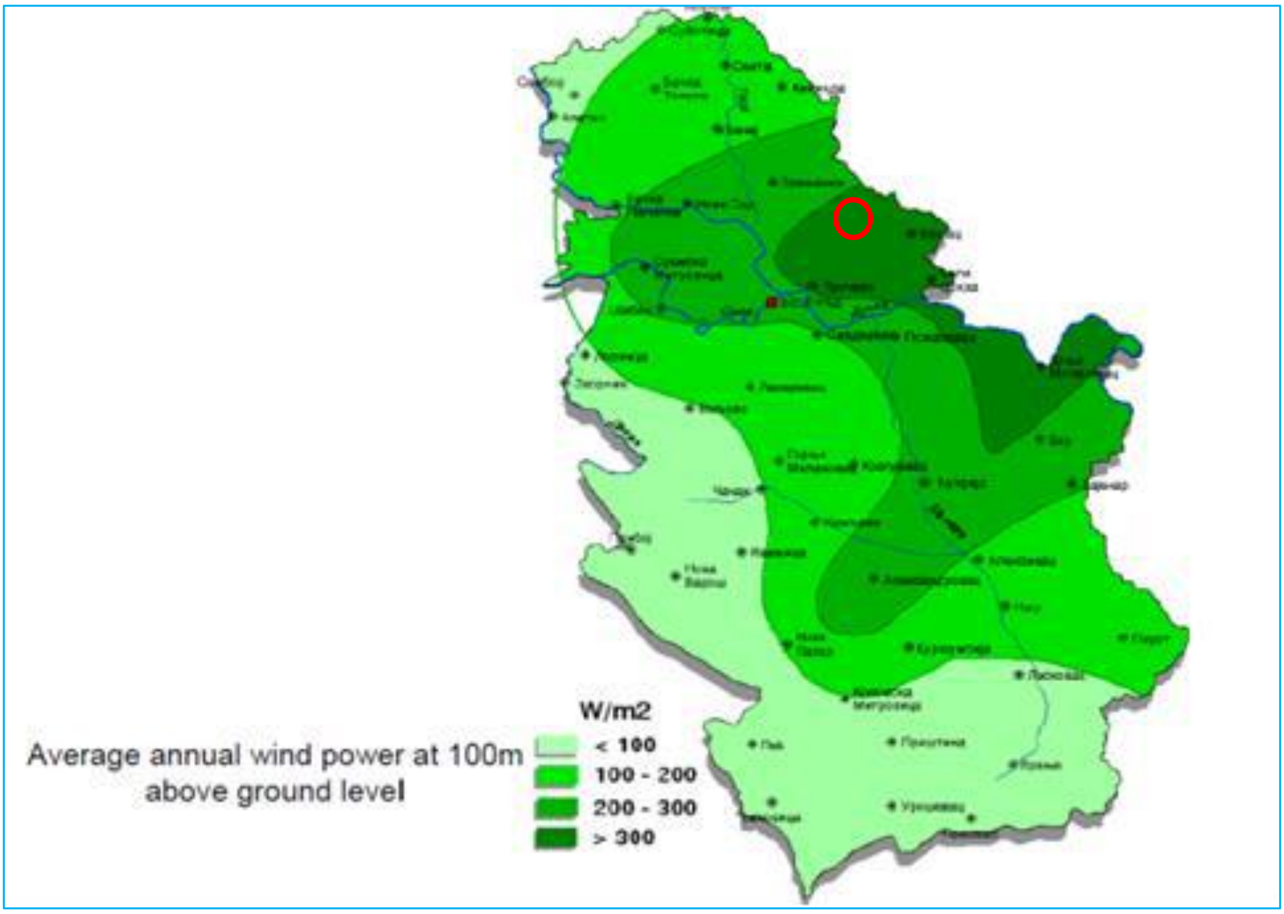

Figure 2-3 Wind Power Map of Serbia

As previously stated, it was always the intention of the owner that the Čibuk 1 WPP would be the first part of a larger project. This staged approach was described within the original Zoning Plans and was discussed openly during conversations with the authorities and the local stakeholders.

As the location of Čibuk 2 has previously been established, a formal Constraints Map has not been developed for this ESIA. However, the C2 Scoping Study required that the ESIA should take account of the following:

- The need to locate the construction compound away from residential properties to ensure that construction noise and community health and safety criteria are met.
- The need to minimise land-take for the construction of roads and other facilities.
- The assessment of turbine noise levels at properties on the outskirts of Bavanište and Mramorak to ensure that there are no significant impacts on local residents.
- The assessment of shadow flicker to ensure that there are no significant impacts on nearby housing.
- The avoidance of any structures or locations that may be suitable for bat roosts.
- The protection of any areas of hedgerows or semi-natural vegetation that may act as wildlife corridors or shelters.

2.3 General Description of Čibuk 2

The development of Čibuk 2 will require:

- Lease or purchase of land plots for the wind turbines;
- creation of appropriate foundations for the wind turbines;
- transport of turbine components to the site;
- installation of the wind turbines using large cranes;
- construction of appropriate infrastructure including underground power and communication cables, a substation and an extension to the existing switchyard (the existing OHL will connect C2 to the national grid);
- operation of the wind turbines for 30 years; and,
- replacement or decommissioning of the wind turbines.

The turbines will be sourced from the international market and will be brought to site in sections. Delivery convoys will be escorted by traffic police as they typically comprise 10 or 12 large vehicles.

Reinforcing steel and concrete for the turbine foundations will be sourced locally.

The Čibuk 2 turbines will be located just to the south-east of the existing Čibuk 1 WPP. Čibuk 2 will include up to 25 WTGs with a maximum total installed capacity of 155 MW. Figure 2-6 shows the layout and boundary of the Čibuk 2 WPP; the C1 turbines are shown in blue (to the north) and that the C3 turbines are towards the centre of the C2 site.

Čibuk 2 covers an area of about 4,750 ha (47.5 km^2). The site is very open, flat and there are a number of small drainage canals that cross the area. One large main drainage canal (a regulated armlet of the Kraljevac Bog), runs roughly south to north crossing the central part of the site. These ditches are dry for the majority of the year.

The site does not include any areas of woodland although there are scattered areas of scrub along some access tracks and along the large drainage ditch.

There are no agricultural buildings within the site boundary and only one summer house.

The entire site is used for intensively managed agricultural production. A large proportion of the land is owned and farmed by an agricultural company (Almex). Almex have combined the land plots that they own and the fields (see Figure 2-4, below) are very large. The main crops are corn and sunflowers.

Figure 2-4 Large open fields farmed by Almex

Figure 2-5 Drainage ditch with scrub growth

The Čibuk 2 site is crossed by a 400kV power transmission line in an East-West direction (coloured purple in Figure 2-6). The Overhead Line (“OHL”) running to the south-east of Dolovo is the interconnector from the Čibuk 1 switchyard to the 400 kV OHL.

The Čibuk 2 turbines will be connected to a new transformer by 33(35)kV underground cable. The C2 transformer will connect to a new substation and then to the existing switchyard. This switchyard is owned and operated by EMS. The switchyard will connect both C1 and C2 to the national electricity grid via the existing OHL and the construction of a new OHL will not be required for C2.

The additional infrastructure for Čibuk 2 will be limited to:

- Access tracks: Upgrading the existing access tracks in order to link the WTGs to the infrastructure on the site. The existing tracks will be surfaced with crushed stone.
- Underground cables: The cables taking power to the sub-station will be buried in trenches running alongside the site access tracks. Communication links between each wind turbine, the meteorological mast and the control building/ substation will also be buried in trenches alongside the site access tracks.
- Areas of hardstanding: Each turbine would require a work area to accommodate the crane and turbine components during construction and operation (the “maintenance pad”).

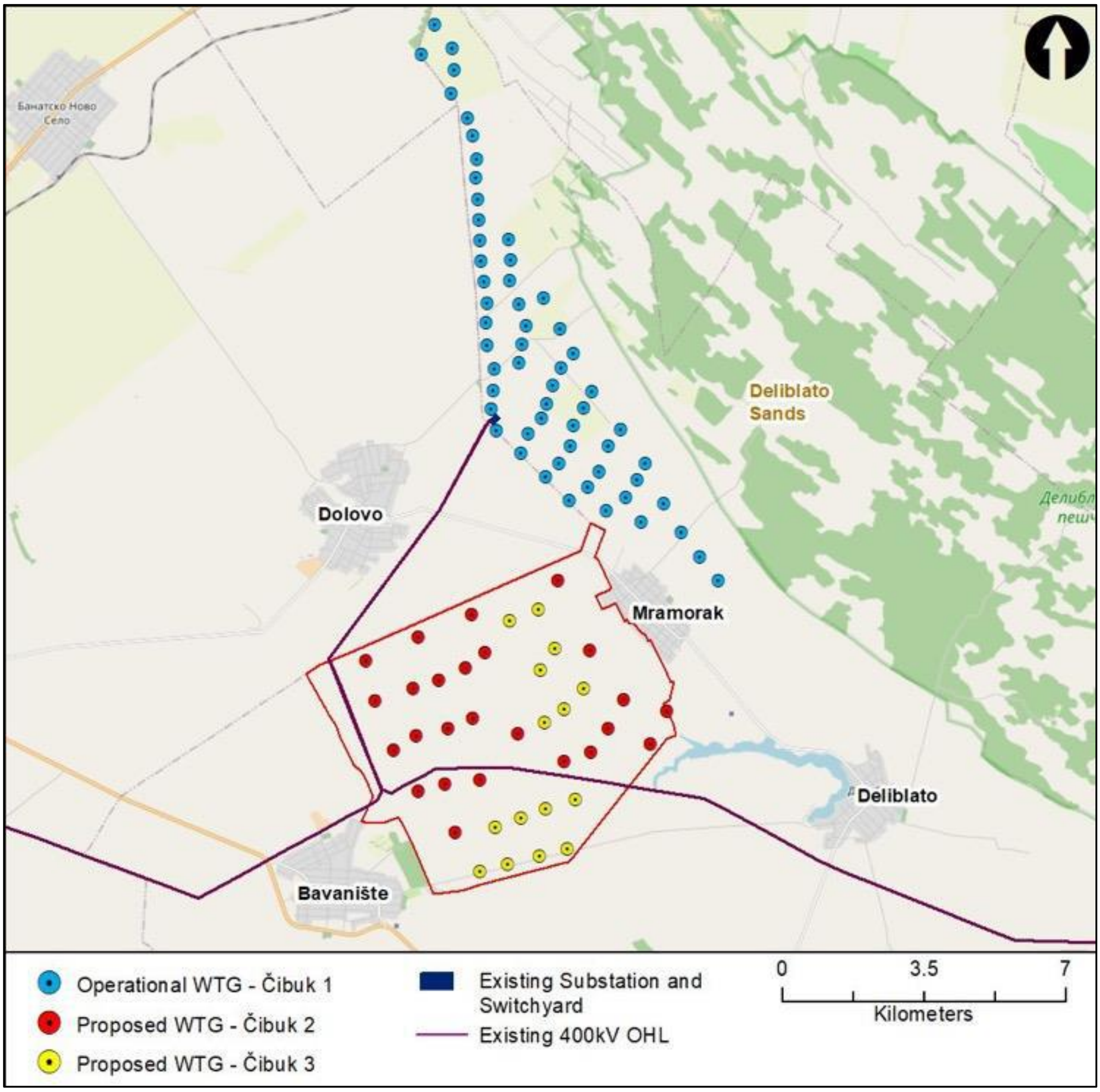

Figure 2-6 Layout of the Čibuk WPP

2.4 Development Programme

At the time of writing, the construction timeline is expected to be:

- Start of construction: Q1 2024.
- Site tracks and roads construction: Q1 2024 - Q2 2024.
- Foundations and WTG crane pad construction: Q1 2024 - Q4 2024.
- Construction of the 400 kV connection and switchyard: Q2 2024 – Q3 2024.
- Connection to the existing OHL and grid: Q2 2025.
- WTG installation: Q2 2025 - Q4 2025.

2.5 Project Developer

The Čibuk 2 WPP will be developed by Masdar Taalari Generation d.o.o Beograd ("MTG"). Čibuk 2 Wind Energy d.o.o Beograd is a special purpose company, created by MTG to develop the Čibuk 2 WPP.

MTG is a joint venture between Masdar, one of the world's leading renewable energy companies, and Taaleri Energia, a Finnish developer of wind and solar projects. Masdar, through its Serbian subsidiary Vetroelektrane Balkana d.o.o., Beograd ("WEBG"), is the owner and operator of the Čibuk 1 WPP.

Wholly owned by the Abu Dhabi government's Mubadala Investment Company, Masdar (the Abu Dhabi Future Energy Company) is supporting the United Arab Emirates ("UAE") transition towards a knowledge-based economy. Masdar consider themselves to be a global leader in renewable energy and sustainable urban development and have already built the world's most sustainable city. Masdar's stated aim is to help maintain the leadership of the UAE in the global energy sector, while supporting the diversification of both its economy and energy sources. Masdar was created to deliver knowledge and industry platforms to stimulate further growth in the wider renewable energy and clean-tech industry, creating new revenue streams for the UAE over the long term. More information on the Mubadala portfolio, ethical standards and reporting can be found on the corporate website: https://www.mubadala.com/en.

Taaleri Energia is one of the largest, dedicated wind and solar investment companies in Europe. The company invests in and manages utility-scale wind and solar investments, primarily in Europe and the US. Taaleri has EUR 2.1 bn of assets under management in its private equity funds and co-investments. Taaleri Plc is listed on Nasdaq Helsinki and has been a signatory of the UN Principles for Responsible Investment (UNPRI) since 2010. More information on the strategy, investments, and sustainability targets for Taalari can be found at: https://www.taalerienergia.com/en.

Further information on the Čibuk project can be obtained from the project website (http://www.cibuk2.rs/en/).

2.6 Support from International Financial Institutions

The development of the Čibuk 1 WPP was supported financially by several International Finance Institutions. The developer and now operator of Čibuk 1, WEBG, provided E&S performance reports to the Lenders every six months throughout the period of construction and annually once the WPP became operational.

The Lenders remain satisfied with the delivery of project, financial support provided to the municipality and are reassured to have confirmation of the low level of impact on bird and bat populations predicated in the ESIA.

C2WE are likely to seek financial support from one or more International Finance Institutes or commercial banks. As a consequence, C2WE have chosen to adopt Good International Industry Practice in the assessment of the environmental and social impact of the Čibuk 2 project. This means that in addition to the regulatory requirements of Serbia, the impact assessment complies with the requirements of the Equator Principles.

Whist the Equator Principles describe the general approach to the assessment, the International Finance Corporation Performance Standards and sector guidance notes will provide the assessment framework. In summary, the Equator Principles describe the main steps in any Environmental and Social Impact Assessment (the ESIA) as follows:

- Screening Study and Equator Principles Categorisation;
- Stakeholder Engagement Plan;
- ESIA Scoping Study;
- ESIA;
- Public Consultation on the ESIA Disclosure Package;
- Management of grievances / objections; and,
- Project Monitoring.

The Equator Principles, International Finance Corporation ("IFC") Performance Standards and subsidiary IFC guidelines are described in more detail in Appendix F of this report.

2.7 The Applicable Requirements

The Scoping Study determined that the ESIA for the Čibuk 2 WPP would be undertaken in compliance with the Serbian regulations on EIA as well as the Equator Principles and the IFC Performance Standards.

In addition, the Scoping Study determined that the design, construction, operation and decommissioning of the Čibuk 2 WPP would be completed in line with:

- All relevant Serbian laws, regulations and Project Permits;

- IFC Performance Standards on Environmental and Social Sustainability (2012);
- IFC Environmental, Health and Safety General Guidelines (2007); and
- IFC Environmental, Health, and Safety Guidelines for Wind Energy (2015).

Together, these documents are defined as the "Applicable Requirements" for the project.

On overview of the Applicable Requirements is provided in this Appendix F of the ESIA Report.

2.8 Approach to the Delivery of an ESIA Acceptable to International Banks

This ESIA has been prepared in line with the methodology described within IFC Performance Standard 1. In summary, the key steps of the ESIA are:

1. The completion of baseline studies to establish the state of the environment and socio-economic conditions prior to the implementation of the Project.
2. Consideration of alternatives to the Project.
3. Preparation of an impact assessment that considers the potential effects of the Project on the established baseline conditions.
4. Assessment of cumulative impacts to identify those combined impacts which may arise from other existing or planned developments in the area.
5. Mitigation design involving the development of measures aimed at reducing any negative impacts.
6. Assessment of residual impacts following the application of mitigation measures.
7. Preparation of an ESIA report detailing the findings of the Impact Assessment and the mitigations recommended.
8. Reporting public consultation performed during the ESIA.

The preparation of the impact assessment (items 3 to 6, above) is a very detailed activity and requires the:

- Identification of the legal framework for the Project and relevant guidance issued by the Lenders;
- determination of significance criteria to assess the level of any identified potential impacts arising from the proposed development;
- identification, prediction and assessment of the likely significance of the environmental and social effects, both positive and negative, of the proposed development (during construction and operation);
- identification of suitable mitigation, enhancement and monitoring measures to prevent, reduce or remedy any likely significant adverse environmental effects; and
- assessment of the significance of any residual impacts (i.e. those remaining following implementation of mitigation measures).

It is important to establish the project Area of Influence ("AoI") early in the assessment as this defines the extent of the baseline studies that need to be completed. The AoI, based on the definition in IFC PS1, should include:

1. The area likely to be affected by Project activities and facilities that are directly owned, operated, or managed (including by contractors) by the Developer:
   - impacts from unplanned but predictable developments caused by the Project that may occur later or at a different location; or
   - indirect project impacts on biodiversity or on ecosystem services upon which 'Affected Communities' livelihoods depend.
2. Associated facilities, which are facilities that are not funded as part of the Project and that would not have been expanded if the Project did not exist and without which the Project would not be viable.
3. Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the Project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

The definition of the AoI for the Čibuk 2 WPP project is described in Section 6.1 of this ESIA report.

Following the definition of the AoI the technical specialists who undertook the impact assessment were able to identify survey areas, stakeholders and Project Affected Peoples who would be consulted and considered as part of the impact assessment. The Project Affected Peoples include persons affected by land acquisition, relocation, or loss of incomes associated with change in land use due to a project.

In compliance with PS1, this ESIA Report contains the following Chapters:

- **Chapter 1**: Presents the **Non-Technical Summary** ("NTS") for the Čibuk 2 WPP project. This NTS will be published separately but has been included at the beginning of the ESIA Report to provide an initial overview of the development.
- **Chapter 2 – Introduction and Context of the ESIA**: Includes a brief description of the project, the expected benefits, alternatives to the Project, the project company and how they may be supported by international banks. The background to the ESIA process and communication of the ESIA are also described.
- **Chapter 3 – Requirement for an Impact Assessment:** Describes the Serbian requirements for an Environmental Impact Assessment and Project Permitting, Lender requirements for an ESIA and the links between the EIA and the ESIA.
- **Chapter 4 – Findings of the Scoping Study**: Includes the consideration of EP Categorisation of the Čibuk 2 WPP and sets out the key issues that were considered during the ESIA.
- **Chapter 5 - Technical Description of the Čibuk 2 WPP**: Provides a detailed description of the project including the technology adopted, the design of the Čibuk 2 WPP and how the turbines will be connected to the existing infrastructure. This Chapter also reviews the WPP against the IFC Guidelines for Wind Energy (considered to be GIIP) designed and in operation for similar WPPs. A brief description of the operation and maintenance of the WPP is described.
- **Chapter 6 - Study Area, Surveys Methodologies and Data Modelling:** Defines the Project Area of Influence for each topic area. The survey methodologies adopted for each topic area are describes as well as the modelling adopted in the assessment.
- **Chapter 7 - Environmental Setting – Natural Geography**: Provides a background to the physical and natural history of the Project area.
- **Chapter 8 - Socio-Economic and Cultural Context – Human Geography**: Provides a background to the human geography of the proposed project area.
- **Chapter 9 – Project Wide Impacts**: Includes the consideration of potential impact of climate change on the project, GHG displaced by the project, and cumulative impacts.
- **Chapter 10 – Impact Significance and Mitigation Framework**: Describes how the impacts and opportunities identified in the scoping study were assessed and provides an overview of the mitigation framework that was adopted by the ESIA.
- **Chapter 11 – Construction: Impact Assessment and Mitigations:** Sets out the assessment of impacts during the construction of the Čibuk 2 WPP. This chapter proposes how the impacts may be managed or mitigated. Residual impacts are also quantified and discussed.
- **Chapter 12 – Operation: Impact Assessment and Mitigations:** Sets out the assessment of impacts during the operation of the Čibuk 2 WPP. This chapter proposes how the impacts may be managed or mitigated. Residual impacts are also quantified and discussed.
- **Chapter 13 – Decommissioning: Impact Assessment and Mitigations:** Sets out the assessment of impacts during the decommissioning of the Čibuk 2 WPP. This chapter proposes how the impacts may be managed or mitigated. Residual impacts are also quantified and discussed.
- **Chapter 14 - Summary of Impacts, Mitigations and Control Measures**: Draws together the findings of the assessments in Chapters 11, 12 and 13.
- **Chapter 15 - Mitigation, Management and Monitoring of Environmental and Social Impact**: Describes the environmental and social management system that will be developed to deliver the Environmental and Social Management and Monitoring Plan.
- **Chapter 16** – **Conclusions of the ESIA**.

The Appendices to the ESIA Report are:

Appendix A – Zones of Theoretical Visibility

Appendix B – Panorama and Photomontages

Appendix C – Ecology and Nature Conservation

Appendix D – Noise Data and Assessment

Appendix E – Shadow Flicker Calculation

Appendix F – Environmental and Social Policy, Legislative Framework and International Standards

Appendix G – Bibliography

The Appendices to the ESIA Report are presented in a separate document that should be referred to when considering the Assessment.

2.9 Project Alternatives

The alternatives to the development of the Čibuk 2 WPP considered are:

1. **No Project**: If the WPP is not built then Serbia will continue its reliance on fossil fuels for energy. The proposed WPP site would continue solely as an area of intense agricultural production.
    - Serbia is a signatory to the Energy Community Treaty. The Treaty requires countries' commitment to in implement EU energy legislation within fixed timeframes. If the Čibuk 2 WPP is not developed then Serbia is less likely to meet this Treaty commitment.
    - Under the Paris Agreement, Serbia has committed to reduce the GHG emissions by 9.8% below 1990 levels by 2030. If the Čibuk 2 WPP is not developed then Serbia is less likely to achieve climate neutrality by 2050.
    - The positive financial benefits to the local communities, through employment, tax income and the use of local suppliers, will not be realised. Vojvodina is a predominantly agricultural county with low incomes and the tax benefits of the WPP will help support the development of local services and infrastructure.
    - The financial agreements with the existing land owners would not be triggered and this additional income will not enter the local economy.
    - The negative environmental impacts associated with WPPs will not occur (noise, visual impact, flicker etc.).
    - The positive financial benefits of the WPP to the local communities (jobs, tax income and social investment) will not be realised.
    - The Scoping Study concluded that there is a legal framework that requires the development of renewables projects; this provides a presumption of development. The Scoping Study also concluded that the level of environmental and social impact was manageable and that there was no over-riding reason why the WPP should not be built.
2. **Alternative Technology**: The conditions of the Project site are optimal for wind development and not favourable for other renewable technologies.
    - Solar energy could be exploited at the Čibuk 2 but this would mean the utilisation of a much larger area of land.
    - A Solar Power Plant would mean the complete loss of agricultural land within the site boundary. This would have a significant negative impact on the livelihood of the landowners and farmers working the land. The development of a WPP would take about 0.4% of the land area, leaving 99.6% in agricultural use.
    - A Solar Power Plant would have an increased impact on the, albeit limited, biodiversity of the area.
    - The Scoping Study concluded that a renewables project based on wind power generation was appropriate for the region and the site.
3. **Alternative Layout**: The Čibuk 2 WPP is the second development phase of the Čibuk Wind Power Plant. The location of the Čibuk WPP was carefully selected in order to minimise environmental and social impact (see above). The first phase of the Čibuk Project (Čibuk 1) has been in commercial operation since April 2019. Phases 2 and 3 or the Project were outlined during the initial design phase. The 2021 Zoning Plan application for Čibuk 2 and Čibuk 3 was based on a layout that was optimised for the installation of 7.5 MW turbines (with higher degrees of separation on the ground). The Zoning Plan was adopted in June 2021 and allows for the construction of up to 41 WTGs. However, C2WE propose to construct no more than 40 turbines, each with a nominal capacity of 6.1MW. The ESIA consultants have concluded that:

- Any fundamental change to the layout of the Čibuk 2 WPP is neither necessary nor feasible.
- Mitigation of the limited impacts of shadow flicker or noise can be managed through the micro-siting of turbines, operational management of selected turbines or the creation of vegetation barriers between the turbines and the receptors.

2.10 Project Stakeholders

According to IFC standards, stakeholders are individuals and organisations that may be directly or indirectly effected by a project either in a positive or negative way, or those who are interested in a project. Residents of the villages Mramorak, Bavanište and Dolovo that surround the Project site, as well as local authorities including those from the municipality Kovin and presidents of local community councils, were identified as the key stakeholder groups for this Project.

As mentioned earlier, a Project Stakeholder Engagement Plan ("SEP") has been developed and is available to interested stakeholders on the Čibuk website (http://www.cibuk2.rs/en/) for questions and comments. The SEP guided engagement with stakeholders during the ESIA development process.

In March 2022, following the completion of the Čibuk 2 Scoping Study and the draft SEP, the Developer organised a first round of engagement public meetings with residents of the above listed villages. The main purpose of the meetings was to present the Project and its timeline (with handouts), to understand people's main questions and concerns, so that they may be adequately addressed through information disclosure, as well as to present the Project grievance mechanism and relevant Project contact details. Invitations to face to face meetings were sent to persons who signed land easement contracts with the Project Developer and meeting notifications were posted on public notice boards at local community offices. Invitations were also sent to two effected municipalities, Kovin and Pančevo, as well as four active hunting associations: "Zec" (Bavanište), Pančevo (Dolovo), "Jedinstvo" (Mramorak) and Kovin.

In the second round of engagement, in June 2022, meetings were held with representatives of the municipality Kovin, two organisations which benefited from the Čibuk social investment programmes, and the local communities of Mramorak and Dolovo. The aims of the meetings were to understand experiences related to the construction and operation of Čibuk 1 and to discuss expected environmental and social benefits and impacts of Čibuk 2, so that all stakeholder questions and concerns are answered in the ESIA document.

A summary of all meetings is presented in Table 2-1 below.

Table 2-1 Summary of Stakeholder Meetings during the ESIA Development Stage

Stakeholder group	Date of the meeting	Meeting venue	No. of partici-pants	Main feedback
Residents of Bavanište village	16.03.2022	Local community meeting room	12 (2 women)	The participants were interested in when construction would realistically start, as their land acquisition instalments are tied to the beginning of works on the project site. The president of the local community asked about land acquisition contract conditions. Another participant asked about the height of the WTGs and why it will be changed as opposed to initial plans. The representative of the hunting association asked about bird surveys and highlighted the importance of proper monitoring.
Residents of Dolovo village	17.03.2022	As above.	0	Despite the efforts of the Developer to invite residents of the community and other local people to the meeting, no one turned up for the meeting.
Residents of Mramorak village	17.03.2022	As above	10 (2 women)	The participants discussed their experiences from Čibuk 1 and stated that some of the land acquisition contracts, were not aligned with the final outcomes, in relation to the location of the WTG and the land that was used during construction. They asked for this issue to be rectified for Čibuk 2. The participants also claimed that contractors did not restore the land that was used and surrounding land to its original condition, i.e. that waste was left behind and that the terrain was not levelled, which caused damages to agricultural machinery. However,

Stakeholder group	Date of the meeting	Meeting venue	No. of partici-pants	Main feedback
				they were satisfied with the financial compensation they received for the damages. Another important issue for local people was damage to local roads caused by heavy machinery and not repaired following construction. Some of the landowners expressed a wish to start receiving easement contract payments as soon as possible, because overall inflation is worrying them. Participants also stated that they are expecting that a part of the profit-sharing agreement for Čibuk 1 will be paid directly to their local community and not just to the municipality. They requested a map of the whole Project, locations of all turbines (which was subsequently provided by the Developer to be hung up in the local community offices).
Municipality Kovin Head of the Economy, Property and Legal Issues and Local Development Department[1] Adviser for Local Economic Development[2]	31.06.2022	Meeting room in the municipality Kovin	2	The representatives of the municipality highlighted that as Čibuk 1 was the first windfarm project to be developed in Serbia, there were many constraints that were overcome. They believe that Čibuk 2 will benefit from the experience and everything will be much more efficient and easier. The municipality is grateful for the benefits of the project and employment, both direct and indirect, was among them. However, when comparing to another significant and recent project in the region (South Stream gas pipeline), the scale of these benefits was much smaller. Land acquisition for the Project was completed successfully and people are satisfied. This is also very important for the municipality as people, especially in Bavanište, are sensitive about land which is very fertile and a source of livelihood. The project has helped improve agricultural tracks and access roads. This has improved the access for agricultural machines and is appreciated by local farmers. The revenue from the profit-sharing agreement has enabled the municipality to invest in local communities (75% for the municipality and 25% for Mramorak local community). Čibuk 2 will extend the benefits to Bavanište village which was not included in the Čibuk 1 arrangements. To date, the revenue has enabled the local municipality to acquire an ultrasound machine for the local health care centre and to implement paving of certain municipal roads. The only negative impact of the project was in relation to damages of local roads and for Čibuk 2 it would be good to ensure that they are fixed without prompting from the municipality.
Citizens Association Serbia, My Home[3] (Dolovo)	31.06.2022	Phone interview	1	The organisation implemented a project entitled “At the end of the day”, which was supported by the owner of the Čibuk 1 WPP (WEBG), through the Project’s Social Investment Plan. The project comprised improvements of the tourist (eco) path on the edge of Deliblato sands (clearing of the path, creating signage and resting areas with benches). The NGO also runs a small shop at the beginning of the path with local products and souvenirs where they also organise festivities. The financial support provided by the owner of the Čibuk 1 WPP is very important for the local communities and the sustainability of citizens associations from them, as

[1] Radovan Mića Vukosavljević
[2] Slađana Ćirikovački
[3] Bojan Vojnov, President of the Citizens Association

Stakeholder group	Date of the meeting	Meeting venue	No. of partici-pants	Main feedback
				they do not have access to a lot of sources of funding. The association Serbia My Home also receives funding from several other donors, including the Ministry of Environmental Protection. The cooperation with the project owner was and continues to be, very good. The process of applying for funding was very clear, easy to follow and transparent. The construction and upgrading of the (Project) road to the settlement Devojacki bunar, on the territory of the Alibunar municipality, created better access to Deliblato sands from all directions, and contributed to local tourism development.
Association of volunteer firefighters[4] (Mramorak)	31.06.2022	The association's office in Mramorak	1	The association is very important for the local population, as a place where the community gathers and where generations of local people have been members. The association regularly participates in national and international competitions, with great success. When the law changed several years ago and they needed to fulfil certain standards to be able to continue operating, the financial support from the Project through the Social Investment Plan, enabled them to fulfil these new standards. The funds were used for financing trainings and procuring valuable, high-quality equipment including personal protective gear (which was also procured in Serbia, further extending the benefits). The association mainly assists with putting out fires set by agricultural workers to clear their land (which is still occurring, although prohibited by law); larger fires are managed by professional firefighters from Kovin. When one of the Čibuk 1 WTG caught fire (September 2019), they were the first on the scene, to block off the area and prevent people from getting too close.
Local community Mramorak President[5]	31.06.2022	Local community meeting room	1	The Čibuk 1 Project has been important for the local community, providing local employment and contributing to the use of secondary services, i.e. provision of accommodation and catering for workers. The community also benefitted in the same way from the construction of the South Stream gas pipeline. Around 20 people from the community were employed during construction, which is significant for such a small community, especially in times when young people are moving to urban centres. There are only a few large agricultural producers in the area, and people mainly work in Pančevo or Belgrade, while agriculture is a secondary source of livelihood. The owners of effected land plots were more than happy with the land acquisition arrangements and compensation. It was stated that overall not a lot of land had been occupied, so there was no impact on livelihoods. Compensation for agricultural damages was provided in a timely and very correct way (engaging independent valuators who evaluated losses even above market value) and people appreciated that. The improvement of agricultural access tracks is seen as positive by the local population; however repairs of damaged local roads does not always happen in a timely manner. This is something to improve for Čibuk 2.

[4] Aleksandar Radosavljević, President of the Association
[5] Aleksandar Paulica

Stakeholder group	Date of the meeting	Meeting venue	No. of partici-pants	Main feedback
				The contractor and subcontractor companies were very cooperative, they assisted whenever possible with local issues (i.e. some smaller local roads were repaired and some of the excavated soil was brought over to another location in the village, as requested by the community. There was no impact on beekeepers or hunting associations as they operate in other locations, and not where the windfarm is located. This is also relevant for Čibuk 3. The local community has grievance forms in their offices and they help people fill them in, when necessary, to be submitted to the Developer. The Developer also provided a map of Čibuk 2 WTG locations to be displayed on the community notice board as requested by local residents who participated in the community meeting in March 2022.
Local community Dolovo Secretary[6]	31.06.2022	Local community meeting room	1 (woman)	When construction for Čibuk 1 began there was a problem with drivers of heavy vehicles not following the planned transport routes (creating safety issues, particularly through the town). The local community made a complaint to the local transport inspection services and order was restored, with no further problems. The settlement Devojački Bunar has been revived since the construction of the road leading to it, many houses have been bought and reconstructed, people are coming to enjoy the nature in Deliblato sands (especially during the Covid pandemic). As in Mramorak, agriculture is a large-scale business for only a few producers who have or rent land and people mainly derive their livelihoods from employment in Pančevo or Belgrade. The village had no kindergarten until recently which significantly prevented women from working. The kindergarten was recently opened and this is extremely important for the village.

2.11 Delivery Team and Limitations of the ESIA

This ESIA report was prepared on the behalf of Čibuk 2 Wind Energy d.o.o Beograd by a consortium of environmental and social specialists led by Pepper Advisory Ltd, UK.

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- Mr. Branko Karapandža, Mr. Marko Raković, Ms. Ines Karapandža, Mr. Uroš Buzurović, Mr. Miloš Popović, Mr. Milan Paunović, and Mr. Rastko Ajtić of Fauna C&M, Novi Banovci, Serbia.
- Mr. Gavin Irvine of Ion Acoustics, Bristol, UK.

[6] Lidija Ankucić Božović

The consortium led by PAL has based its conclusions and recommendations on the information made available during the ESIA. It should be recognised that the mitigation measures suggested or required by the ESIA may result in some modifications to the design of the facility.

None of the work performed during the ESIA shall constitute or be represented as a legal opinion of any kind or nature, but shall be a representation of the site visits findings and examination of records. No warranties or guarantees, expressed or implied, are included in or intended by the report. The report has been prepared in accordance with the current generally accepted practices and standards consistent with the level of care and skill exercised under similar circumstances by professional consultants or firms that perform the same or similar services.

3 Serbian EIA and Project Permitting

There are no specific environmental permits within Serbia. However, there are a number E&S conditions in the development permits that regulate the construction, operation and decommissioning of projects such as Čibuk 2. This section describes the how the need for an EIA is determined and outlines where E&S conditions are applied during the development process

3.1 Serbian Requirement for an Environmental Impact Assessment

Serbian EIA regulations require WPP developments of 10 MW installed capacity or over to be subject of an environmental impact assessment procedure. The EIA for Čibuk 2 has been submitted and it was based upon this ESIA report. The baseline data sets and surveys used for the EIA and the ESIA were the same.

WPPs are listed in Annex II of a relevant EIA regulation meaning that a competent authority decides whether to proceed with a full EIA or conclude the process after the screening stage. Over the past 10 years it has been authorities' practice to require a full EIA for all WPP developments of 10 MW capacity or over. An overview of the EIA process in Serbia is shown in Figure 3-1 below.

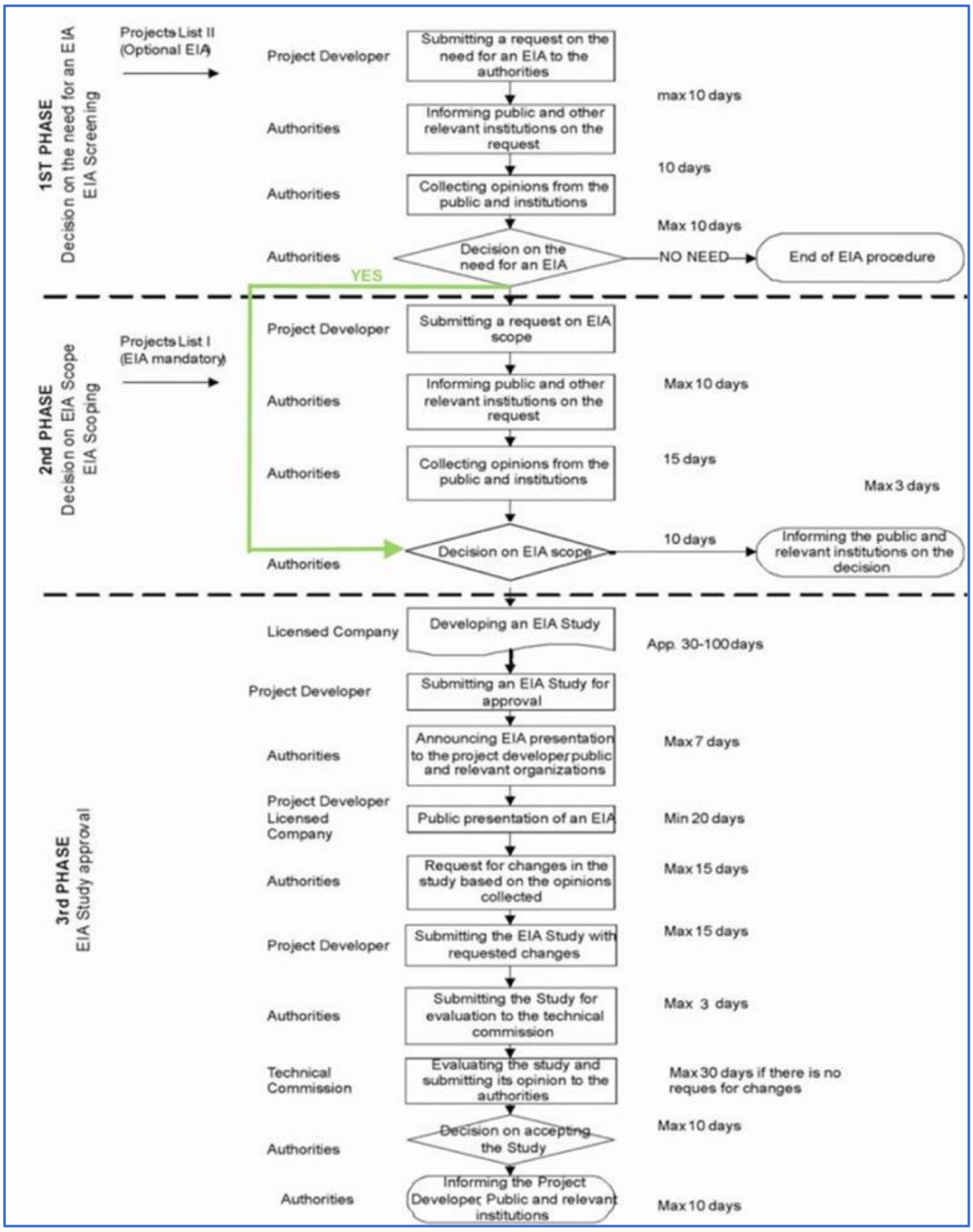

Figure 3-1 Serbian EIA Procedure

See Appendix F of this ESIA for further detail on the legal framework for the EIA.

3.1.1 Zoning Plan and Location Conditions

To initiate the Project development (and the Serbian EIA process), the local authorities, in this case the Municipality of Kovin had to develop and adopt a Zoning Plan that included a basic description of the project. The approval of the Zoning Plan required consultation with a series of national and regional statutory bodies that provided their conditions under which a development was possible. The consultees highlighted potential conflicts with existing or planned infrastructure, required pre-construction investigations and studies and described technical and management measures that must be implemented as part of the project development.

The Zoning Plan for Čibuk WPP was adopted in June 2021 and defined the wind power plant as comprising 41 wind turbines with a maximum height to blade tip of 240m and a maximum installed capacity of 315MW. A subsequent Strategic Environmental Assessment (as required under Serbian regulation) was approved by the Municipality of Kovin in June 2021.

Once the Zoning Plan was agreed, the Developer were given the Location conditions in July 2022 (in practical terms a location permit). The Location conditions were issued for Čibuk 2 (but not C3) for maximum installed capacity of 155MW based on 25 turbines. Maximum height to blade tip has been set at 240m, the maximum rotor diameter is 190m, maximum blade length is 95m, and maximum hub height is 160m.

The Location conditions were provided by the same statutory stakeholders involved in the development of the Zoning Plan. The list of statutory bodies involved with the planning (including Zoning, Location permitting and subsequently in the EIA) is provided in Table 3-1.

Table 3-1 List of Statutory Stakeholders involved in the Project Planning

Statutory Stakeholder	Role in Planning
Municipality of Kovin	Prepares the Zoning plan and Strategic Environmental Assessment for the project.
Provincial Secretariat for Energy, Construction and Transport of Vojvodina	Awards the Location conditions, the Building permit, the Operation permit.
Provincial Secretariat for Urbanism and Environment of Vojvodina	Awards the EIA consent.
Ministry of Mining and Energy of Serbia	Awards the Energy permit.
Provincial Institute for Nature Conservation	Provides nature conservation conditions.
Provincial Secretariat for Agriculture, Water Management and Forestry of Vojvodina	Awards the Water permit.
Public Water Management Company “Vode Vojvodine”	Provides conditions related to water and wastewater management.
Institute for Cultural Heritage in Pančevo	Provides conditions for protection of cultural heritage.
Republic Institute for Seismology	Provides information on seismological conditions.
Ministry of the Interior of Serbia, Department for Protection and Rescue in Belgrade	Provides fire protection conditions.
Ministry of Defence of Serbia	Provides conditions on potential conflicts with the national defence infrastructure.
Oil and Gas Producer “NIS”	Provides information on existing oil and gas exploration and exploitation fields and potential conflicts with oil and gas infrastructure.
Public Road Management Company “Roads of Serbia”	Provides conditions on local road network connections.
Public Gas Management Company “Serbia Gas”	Provides conditions on natural gas infrastructure and potential conflicts.
Public Gas Management Company “Transportgas Serbia”	Provides conditions on natural gas infrastructure and potential conflicts.

Statutory Stakeholder	Role in Planning
Public Company for Crude Oil and Petroleum Products Transport "Transnafta"	Provides information on potential conflicts with national oil products pipeline network.
Republic Hydrometeorological Institute	Provides information on potential interference with weather radars and other meteorological infrastructure.
Public Forest Management Company "Vojvodina Šume"	Provides information on woodland and conditions for construction.
Public Railway Infrastructure Management Company "Railway Infrastructure of Serbia"	Provides information on potential conflicts with local railway network.
Public Energy Transmission Company "Elektromreža Srbije"	Provides conditions for connection to the national transmission grid.
Public Electricity Distribution Company "EPS Distribution"	Provides conditions for connection to the electricity distribution network.
Civil Aviation Directorate of Serbia	Provides conditions on aviation safety, related marking and lighting.
Serbia and Montenegro Air Traffic Services Agency	Provides information on potential interference with aviation radars;
Public Broadcasting Company "Emisiona Tehnika i Veze"	Provides information on potential interference with radio and television broadcast transmitters.
Public Telecommunications Company "Telekom Srbije"	Provides conditions on connection to the telecommunication network.
Mobile network operators	Provide conditions on potential conflicts with existing or planned base stations.
Local public utility companies	Provide information on potential conflicts with local waste management infrastructure.

3.1.2 Serbian EIA - Screening and Scoping

As the Čibuk 2 WPP is an Annex II development under the Law on Environmental Impact Assessment, a screening judgement must be obtained from the regulator (Provincial Secretariat for Urbanism and Environment of Vojvodina). Screening and scoping exercises are based upon the conceptual design of the project whilst the EIA Study is based on the preliminary design.

In August 2022, the Developer submitted the screening application to the regulator. The screening document was publicly disclosed for 15 days. The general public have the right to appeal to the government if they object to the development. The government must determine within 30 days if there should be an appeal.

The statutory format of the Serbian screening report is comprehensive and is equivalent to an ESIA Scoping Study. It has become a regular practice of Serbian authorities to decide on the screening by directly issuing of the scoping decision. Such practice shortens the administrative time which usually results in a total of 40 days for the screening/ scoping stage.

In September 2022, the regulator issued the scoping decision, deciding that the EIA Study for the proposed Čibuk 2 WPP was mandatory.

The scoping decision remains valid for 12 months. If the EIA Study is not submitted within that period, the decision expires and the EIA procedure must be restarted.

While the EIA is considered by the competent environmental authority (Provincial Secretariat for Urbanism and Environment of Vojvodina), the Building permit is within the competence of the Provincial Secretariat for Energy, Construction and Transport of Vojvodina.

The Energy permit is not directly connected to the Location conditions. It is part of a concurrent permitting procedure defined by energy regulations within the competence of the national Ministry of Mining and Energy of Serbia. The Energy permit is based upon the national energy development strategic and planning documents. In practice, the Energy permit can be acquired relatively early in the development process. As such, the Energy permit contains a rather general overview of environmental requirements that the windfarm development must comply with.

The Location conditions, the Energy permit, and the draft EIA Study are prerequisites for the Building permit. The Registration of Works is a final step and a key result of the planning and energy permitting processes and requires submission of the Building permit and approval of the EIA. Only when the Registration of Works is acquired, can WPP construction begin.

The permitting of substations, switchyards and overhead power lines for WPPs is subject to an independent legal procedure, separated from project permitting. The OHL and switchyard permitting procedure is conducted in liaison with the state-owned transmission grid operator "Elektromreža Srbije (EMS) and on behalf of EMS. This includes the EIA procedure where EMS is considered to be a formal developer and operator of the switchyard and OHL connection line.

The Čibuk 2 WPP project does not include construction of an OHL line. However, a new substation will be constructed, and a new transformer will be installed, in order to connect the Čibuk 2 WTGs to an extended switchyard and then to the existing OHL. The Čibuk 2 substation and transformer have been approved through a new planning ("Urbanistic Design") process.

For both the proposed Čibuk 2 substation and switchyard two separate EIA screening applications have been submitted to the competent authority - the substation application on behalf of the Developer and the switchyard application on behalf of EMS. The current practice of Serbian authorities has been to conclude the EIA process for substations and switchyards based on screening applications, judging that full EIAs are not mandatory.

3.2 Complying with Legal Requirements and Permit Conditions

This section provides a summary of the E&S conditions in the development permits that directly regulate the construction, operation and decommissioning Čibuk 2 (also see section 3.1.1). These conditions form part of project development permits as there are no specific environmental permits within Serbia.

E&S conditions within the Location conditions were issued by the Institute for Nature Conservation (IfNC), Provincial Secretariat for Agriculture, Water Management and Forestry (PSAWMF), and the Institute for Cultural Heritage from Pančevo.

It is noted that the condition issued by the IfNC are very general in nature and are considered by the ESIA consultants to be 'standard' conditions. None of the conditions required by the IfNC within the Location conditions are specific to the Čibuk 2 project.

Table 3-2 E&S Conditions in Permits

Permit	Date Obtained	E&S Conditions
Energy Permit	To be obtained	No E&S conditions are set by the permit.
Zoning Plan	June 2021	The Zoning Plan defined the WPP as comprising 41 WTGs with a maximum height to blade tip of 240m and a maximum installed capacity of 315MW. The Nature Protection Conditions for pre-construction ecological surveys require the developer to prepare a study of impacts of proposed WPP on birds and bats. The surveys must be undertaken for a minimum of one year. The study must present data on: • all bird and bat species occurring at the site and in the surroundings during the survey period of one year at least, • international and national conservation and protection status of all species, • populations of all species, • seasonal changes in population numbers during the survey period, • commuting and migration routes, • breeding sites, • staging sites, • wintering sites, • possible significant impacts of the WTGs on birds and bats, • overview of measures to avoid, mitigate and offset all significant adverse impacts of the WTGs on birds and bats.

Permit	Date Obtained	E&S Conditions
Location Conditions	July 2022	**Design/ Pre-Construction:** • The WPP shall comprise up to 25 WTGs, the maximum height to blade tip shall not exceed 240m. • The horizontal distance between two turbines shall be at least one height to blade tip. • Blades must be painted and lighted in line with regulations on obstructions to air navigation. • Any waste dump (e.g. municipal or construction waste) shall be removed from the WPP site. • A minimum 5 metre setback shall be established between the underground cable route and a drainage canal. • Archaeological rescue excavation must be undertaken prior to commencement of the earthworks for foundations of the WTGs No. 1, 8, 12, 18, 33. **Construction:** • Cable trenches and turbine foundations should be properly backfilled to keep out burrowing animals and prevent attracting raptors. • Any damage to drainage canals caused by construction activities must be restored to its previous condition. • WTG concrete foundations are not allowed to be built within wetland habitats (bogs, surface-water depressions, puddles, etc.). • Archaeological supervision shall be conducted during the earthworks for foundations of the WTGs No. 7, 11, 16, 19, 22, 23, 25, 27, 28, 31. • In case of chance finds, all work must be immediately halted and the area protected until the Institute for Cultural Heritage in Pančevo secures the findings. • If potentially valuable geological or paleontological features are discovered during the excavation works (e.g. fossils, minerals, crystals), the Developer must notify the national Ministry of Environment within 8 days. **Operation:** • To protect the migratory species, the WPP must be equipped for continual monitoring of bird and bat movements over the site area. • The post-construction bird monitoring must be undertaken for a period of at least 1 year and must be particularly focused on Saker falcon (*Falco cherrug*) and the WPP site area within 1km of the Kraljevac Special Nature Reserve.
Building Permit	Expected in Q2 2023	No E&S conditions are set by the permit. The EIA Study (unconsented) is included in the permit application.
Registration of Works	Expected in Q4 2023	The EIA consent is a prerequisite for the Registration of Works and requires implementation of mitigation measures listed in the EIA Study.
Water Permit	Upon completion of construction (Q1 2026)	The Water Permit will set requirements related to wastewater management during the WPP operation, including any activities which might have an impact on the local drainage canals.

In addition to the project specific permit conditions, the Čibuk 2 project must comply with the Serbian framework of general environmental and health and safety legislation. A register of EHS legal requirements applicable to Čibuk 2 has been developed by the ESIA consultant to enable the developer to manage this complex issue. This is referred to as the Register of Legal Requirements, see Table 15-6.

It is noted that there is a strong regulatory framework within Serbia to manage Occupational Health and Safety risk. OHS risk has not been considered as a specific risk against each phase of the development. However, the ESMMP, and the delivery ESMS make particular reference to OHS. The ESMS will include a detailed OHS Management Plans that must be adopted during construction, operation and decommissioning.

The Register will form part of the Project Environmental and Social Management System (ESMS) and sits alongside the ESMMP (Table 15-3). and the ESMS Management Plans will be designed to meet the requirements of the IFC Guidelines.

3.3 Lender Requirements for an Environmental and Social Impact Assessment

As C2WE is likely to seek financial support for the project from an International Finance Institution or a major commercial bank they have chosen to apply Good International Industry Practice in the assessment of the environmental and social impact of the Čibuk 2 project. This means that in addition to the regulatory requirements of Serbia, the impact assessment will comply with the requirements of the Equator Principles. A detailed explanation of the Equator Principles is provided in Annex F of the ESIA Report.

The ESIA Scoping Study for the Čibuk 2 was completed in December 2021. The findings of the Scoping Study are presented in Chapter 4 of this ESIA report. The Scoping Study concluded that the Čibuk 2 project was a Category B project; having limited environmental and social impacts. In order to fully assess the environmental and social risks and impacts, the Scoping Study recommended that a formal ESIA be completed. The potential impact on biodiversity was considered to be medium to high and the surveys began in March 2021. The ESIA was prepared at the end of 2022 and was published in the spring of 2023.

The first draft of the Stakeholder Engagement Plan was prepared at the same time as the Scoping Study and contacts for any questions, comments or grievances were made available on the C2WE website. One of the primary objectives of the SEP is to ensure that the project engages with local stakeholders at an early stage so that they can contribute their views and provide relevant information to the ESIA.

Whilst the Stakeholder Engagement Plan ("SEP") feeds into the Scoping Study and then to the ESIA itself; the SEP and the ESIA are run in parallel. The ESIA Disclosure Package that is published by the EPFI includes the SEP, the ESIA report or Statement, and a Non-Technical Summary. It is noted that the Non-Technical Summary is presented in Chapter 0 of this ESIA report.

A more detailed description of the legal, policy and institutional framework for the ESIA, including the Equator Principles, IFC Performance Standards and subsidiary IFC guidelines, is provided in Appendix F of this ESIA.

3.3.1 Links Between the EIA and the ESIA

The Serbian EIA and EP ESIA processes are generally aligned in terms of the requirements for assessment of environmental impact. However, an EP ESIA is an integrated activity which considers a broad range of topics within the defined Area of Influence (see Section 6.1 of this ESIA Report). As described in Section 3.1.1 of this ESIA report, many of these topics are managed via the local development planning process and are outside the formal environmental impact assessment process.

There are synergies between the requirements for an EIA under Serbian regulations and an EP compliant ESIA. The following

Table 3-3 summarises these links and overlaps. The key difference between the two approaches is that Serbian environmental regulation does not recognise environmental management plans as a control and mitigation instrument. Consequently, the Serbian EIA requires detailed mitigation measures to be proposed already in the EIA. An EP compliant ESIA will include an Environmental and Social Management and Monitoring Plan ("ESMMP") that links to an Environmental and Social Management System ("ESMS") and its' subsidiary Management Plans, see section 15.2 of this ESIA Report.

Table 3-3 Links between the Serbian EIA and an EP ESIA

Activity	ESIA	EIA	Comments
Screening Study	✓	✓	The Serbian Screening Study is more detailed than a Screening Study under international standards and is equivalent to an ESIA Scoping Study. WPPs of 10 MW power or over are subject to a Screening Study in Serbia.
Scoping Study	✓	✓	A Scoping Study is not required in Serbia if a Screening Study was submitted and the authority decided that an EIA Study is required. The authority can issue the Scoping Decision based on the Screening Study. The Serbian Scoping Decision does not scope out any impact, i.e. all impacts have to be considered in the EIA Study.
Stakeholder Engagement Plan	✓	✗	A formal stakeholder engagement plan is not required under Serbian legislation. Stakeholder consultation is part of the EIA process; however the process is a formal one and does not include reaching out to communities to understand their views and concerns.
Consideration of alternatives	✓	✓	Both the impact assessment process for the purposes of investment and national regulatory requirements, require the consideration of other feasible approaches, including alternative locations, technologies, scales and 'no project' options.
Environmental Impact Assessment	✓	✓	The EIA requirements are generally aligned. The standards adopted in the environmental assessment undertaken for the purposes of the ESIA should be in line with European and other international best practice. The requirements under the national EIA regulatory process need to ensure compliance with national legislation and not the regulatory requirements outside of the country.
Environmental effects in case of accidents	Limited	✓	The Serbian EIA legislation requires more detailed analysis of environmental effects in case of accidents which includes specification of hazardous substances used, emergency preparedness and response, remediation measures, etc.
Mitigation Measures and Monitoring	✓	✓	Serbian EIA requires detailed mitigation measures and environmental monitoring that will be implemented during construction and operation. This has to incorporate requirements issued by competent authorities. An ESIA provides detailed mitigation measures to be specified by appropriate construction/ operation management plans.
Socio-Economic Impact Assessment	✓	Limited	The impact assessment for banking requirements requires an integrated approach including full deliberation of the socio-economic effects. The national regulatory requirements for impact assessment are primarily focused on environmental requirements with other requirements encompassed in other regulatory (e.g. 'planning') mechanisms. A formal socio-economic impact assessment is not required under national legislation. However, local national legislation does require assessment of effects where impacts are associated with impacts to human health.
Non-Technical Summary (NTS)	✓	✓	NTS is required as a disclosure document for both the national procedure and banking requirements. The Serbian NTS has to incorporate complete sections on Mitigation Measures and Monitoring, as provided in the EIA Study.
Public Consultation & Disclosure	✓	✓	The public consultation process for both investment and national regulatory purposes is required. National public consultation has a more formal character and is led by the regulatory authority.
Management of Grievances and Objections	✓	✗	A Project Grievance Mechanism to respond directly to community / affected people's concerns is not a formal requirement under the national regulatory requirements. However, grievances are reported under the consultation process and are encompassed under other regulatory mechanisms (e.g. the local 'planning' process).

4 Findings of the ESIA Scoping Study

4.1 Project Categorisation

The Scoping Study determined that the Čibuk 2 WPP to be defined as a Category B project. The EPs describe a Category B project as having "*potential limited adverse environmental and social risks and/ or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures*". The Scoping Study opinion was based on:

- A review of the Čibuk 1 ESIA.
- The construction and operational monitoring data from the Čibuk 1 WPP.
- Local acceptance of the Čibuk 1 WPP and the likely impact on project stakeholders of the Čibuk 2 WPP.
- The reversibility of the potential environmental impacts should the WTGs be removed at the end of the WPP's operational life.
- The scale of the Project Area of Influence and the potential environmental and social impact of the wind power plant.
- The optimisation of the site layout to minimise the environmental and social impacts of the wind power plant.

The EPs do not require every Category B project to have a detailed ESIA. However, to ensure the highest standards of openness, impact assessment, mitigation and management of the Čibuk 2 WPP development, C2WE will undertake a full ESIA in compliance with the Equator Principles as follows:

- EP 1 requires that the developers for all Category B projects conduct an Environmental and Social Impact Assessment;
- EP 4 requires that all Category B projects develop and maintain an Environmental and Social Management System (ESMS) and prepare an Environmental and Social Monitoring and Management Plan (ESMMP) that will be adopted during the construction, operation and decommissioning phases of the project;
- EP 5 requires that the developers of all Category B projects demonstrate "effective" Stakeholder Engagement as an ongoing process. This requires the identification of any specific Affected Communities;
- EP 6 requires that, if appropriate, Category B projects establish a Grievance Mechanism;
- EP 7 and EP 9 requires that the developers of all Category B projects appoint an Independent Environmental and Social Consultant, if appropriate, to carry out an Independent Review of the ESIA including the ESMPs, the ESMS, and the Stakeholder Engagement Plan and to review the progress of the project;
- EP 8 requires that the EPFI will covenant with the developer to deliver the ESMP on all projects that they finance (and other EP Action Plans) and ensure compliance with local regulations;
- EP 10 requires that the developers of all Category A projects, (and Category B projects if appropriate) prepare a summary of the ESIA (usually as a Non-Technical Summary) and make this available on their website.

The Project Area of Influence for the Čibuk 2 WPP project is described in Section 6.1 of this ESIA.

4.2 Determination of the Key Issues for the ESIA

The Scoping Study established the key effects of the Project that should be considered during the ESIA, both positive and negative, and the level assessment required within the ESIA. The Scoping assessment considered data availability, data gaps and recommends suitable survey and research methodologies.

The evaluation of the significance of impacts and opportunities includes consideration of:

- Sensitivity of receiving environment (i.e., the sensitive receptors identified by the technical experts);
- extent and magnitude of the impact;

- reversibility and duration of the impact;
- inter-relationship between impacts; and
- type and extent of cumulative impacts.

The assessment of each impact or opportunity is complex and the significance of impacts allocated within the Scoping Study report was based upon the judgement of the technical experts undertaking the Study.

The Scoping Study allocated a level of significance to each impact or issue against the following three categories. The level of significance relates to the seriousness of the potential impact and the data or information required to undertake an appropriate assessment:

- **Significance Level One: Detailed Assessment**: Undertaken on environmental and social issues which have the potential to create a major impact or could significantly risk the viability of the project. These detailed assessments usually require the completion of extensive survey work. These issues can be considered to be Red Risks to the delivery of the Project.
- **Significance Level Two: Indicative Assessment**: Undertaken on environmental and social issues which have the potential to create a moderate, or undefined levels of impact. These issues can be considered to pose a medium risk to the delivery of the project, i.e. Amber Risks. These indicative assessments often require additional data collection or limited survey work to fill any gaps in the existing data set.
- **Significance Level Three: Limited Assessment**: Undertaken on environmental and social issues which are likely to create a limited impact, i.e. Green Risks. These impacts are often readily mitigated and managed using well known techniques that will be described in the Project ESMS and the associated Management Plans.

The Scoping Study categorised the impacts of Čibuk 2 as:

Significance Level One Issues

- WTG layout (as the primary mitigation against the potential impact of shadow flicker and noise).
- Ecology and Nature Conservation – potential impact on birds;
- Ecology and Nature Conservation – potential impact on bats;
- Cumulative Impact;
- Landscape and Visual;
- Shadow Flicker.

Significance Level Two Issues

- Socio-economic;
- Traffic and Transport;
- Operational Noise.

Significance Level Three Issues

- Ecology and Nature Conservation – potential impacts on habitats and species other than birds and bats,
- Noise during construction and decommissioning;
- Archaeology and Cultural Heritage;
- Surface Water and Effluent;
- Land and Groundwater;
- Aviation Safety and Radars Obstructions;
- Electromagnetic Interference and Telecommunication;
- Ecosystem Services;
- Climate Change;
- Air Quality;
- Community Health, Safety and Security.

The Scoping Study confirmed that there are no Indigenous Peoples within the Area of Influence and this topic has been screened out of the ESIA process.

The rationale behind these assessments is provided in Table 4-1, Table 4-2, and Table 4-3,below.

Table 4-1 Summary of Level One Issues

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
1	WPP design and WTG layout	The Čibuk 2 WPP site is located between the villages of Bavanište, Dolovo, and Mramorak. The design and layout of the WPP will be the primary mitigation for a number of the E&S effects identified by the Scoping Study including the impacts on birds and bats, shadow flicker, noise, and ice throw.	Specific consideration will be given to: • Layout and micro-siting of the WTGs to mitigate risk associated with the proximity to residential housing. • GIIP as described within the IFC Environmental, Health, and Safety Guidelines for Wind Energy (2015). • Size and location of the construction compound. • The design review will also consider the potential impact of climate change.
2	Ecology and Nature Conservation – Birds	Potentially significant direct impacts on protected bird species. These potential impacts include the habitat loss/ degradation/ fragmentation, displacement and mortality. Consideration will be given to potential cumulative impacts on bird populations with other WPPs operating and planned within the region. These potential impacts include the cumulative habitat loss, displacement/barrier effects and cumulative mortality.	Extensive survey work is required over a one-year period to ensure that a sufficient impact assessment and mitigation strategy can be developed within the ESIA. The surveys will include: • Vantage Point (“VP”) Surveys, • Breeding Raptor Survey (walkover census), • Breeding Farmland Bird Survey (transects sampling), • Wintering waterfowl surveys – Feeding distribution surveys, • Surveys to inform CHA (if triggered by occurrence of qualifying species). The bird surveys will be undertaken in compliance with NatureScot (formerly SNH) Guidance (2000, 2012, 2017, 2018). The detailed methodology for the bird surveys is provided in Appendix Seven of this SS Report. The VP surveys are designed to quantify the level of flight activity and its distribution over the survey area. Data can also be used to provide an overview of bird usage of the site, which will inform the overview of potential disturbance and displacement. The VP surveys will provide input data for the Collision Risk Model (“CRM”). The CRM used in the assessment has been developed by NatureScot (formerly SNH) and the British Wind Energy Association (BWEA) (Percival et al. 1999, Band 2001) and is currently considered the industry standard in this field. Breeding Bird surveys and Feeding Distribution surveys will allow the evaluation of occurring population numbers, site’s importance and help quantify impacts from disturbance and displacement. If triggered by occurrence of qualifying species, CHA will be undertaken in accordance with IFC PS6/ EBRD PR6. Following completion of surveys, an assessment will be carried out to determine impacts and their significance, following CIEEM (2016), European Commission (2020), and NatureScot (formerly SNH) guidelines (2018). The significance will be based on the relationship between receptor sensitivity and impact magnitude, and assessed

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
			quantitatively wherever possible. Appropriate mitigation will be developed to reduce any adverse impacts and enhance the beneficial. Cumulative impacts will be identified where they are likely to occur and assessed quantitatively wherever possible, in compliance with IFC (2013) and NatureScot (formerly SNH) guidance (2012). The findings of the IFC sponsored RCIA will be considered and reviewed.
3	Ecology and Nature Conservation – Bats	Potentially significant direct impacts on protected bat species. These potential impacts include the habitat loss/ degradation/ fragmentation, displacement/ barrier effects and mortality. Consideration will be given to potential cumulative impacts on bat populations with other WPPs operating and planned within the region. These potential impacts include the cumulative habitat loss and cumulative mortality.	Extensive survey work is required over a one-year period to ensure that a sufficient impact assessment and mitigation strategy can be developed within the ESIA. The surveys will include: • Investigation of roost sites. • Manual bat detector surveys at ground level (transects). • Automated bat detector surveys at WTG locations, • Automated bat detector surveys at height (if mast will be available for installation of the equipment). Since EUROBATS (Rodrigues et al. 2015) and BCT (Hundt ed. 2012, Collins ed. 2016) guidelines are not fully compatible (e.g. details of survey methodologies), EUROBATS will be followed as a key reference for the methodological design. having broader geographical scope, and thus better adapted and applicable to Serbian situation. The detailed methodology for the bat surveys is provided in Appendix Seven of this SS Report. Following completion of surveys, an assessment will be carried out as part of the ESIA to determine impacts and their significance, following CIEEM (2016), European Commission (2020), EUROBATS' (Rodrigues et al. 2015), and BCT (Hundt ed. 2012, Collins ed. 2016) guidance. Significance will be based on the relationship between receptor sensitivity and impact magnitude, and assessed quantitatively wherever possible. Appropriate mitigation will then be developed to reduce any adverse impacts and enhance any beneficial. Cumulative impacts will be identified where they are likely to occur and assessed quantitatively wherever possible, in compliance with IFC (2013) guidance. The findings of the IFC sponsored RCIA will be considered and reviewed.
4	Cumulative Impacts	The Čibuk 2 WPP has the potential to generate cumulative environmental impacts with other potential WPP developments in South Banat.	Information on other proposed WPPs will be provided from publicly disclosed spatial plans, zoning plans, Strategic EIA Reports, ESIA Reports and/or EIA Studies and survey reports. A desk-based qualitative assessment will consider all WPP developments that will be likely to use Pančevo port, part of the route for delivery of large turbine components, or roads for the transport of construction materials (including the same borrow pits). Management and mitigation measures will be proposed where necessary.

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
			For the cumulative LVIA (CLVIA), the NatureScot (formerly SNH) guidance: Assessing the Cumulative Impact of Onshore Wind Energy Developments (2012) will be followed. Based upon the previous experience with cumulative Banat windfarms, the study area of 30km will be used for the CLVIA. Depending on the identified cumulative WPPs, cumulative ZTV plans will be created and representative cumulative viewpoints selected. Cumulative visualisations will be produced. A cumulative noise assessment for operational impacts will be carried out if there are any proposed schemes which are predicted to have noise levels within 10dB of those from Čibuk 2. This will certainly include Čibuk 1. A cumulative shadow flicker assessment will be carried out for the operational Čibuk 1 WPP and proposed Čibuk 2 WPP. The cumulative area of influence includes up to 10 receptors. Cumulative impacts of bird and bat operational mortality will be assessed in compliance with IFC (2013) guidance and the IFC sponsored RCIA using PBR method.
5	Landscape and Visual Impact	The proposed WPP will have a direct impact on the physical landscape elements on the site due to removal of land cover and introduction of new tall structures (up to 240m to blade tip) with moving elements into a flat open agricultural landscape. The WPP will create new visual effects for people living, travelling or visiting the area.	The landscape and visual assessment will be based upon a desk study and field observations; Based upon the previous experience with Banat windfarms, the study area of 30km will be used for the Čibuk 2 WPP. Zone of Theoretical Visibility (ZTV) models will be calculated using the ArcGIS software for a selected (or worst-case) turbine model. ZTVs will include both hub height and blade tip scenarios; • The LVIA will examine the potential effects of the Project on the landscape and visual amenity of the study area; • Fieldwork will be undertaken to select the relevant viewpoints and take viewpoint photographs as a basis for visualisations. A range of visualisations (up to 15) will be produced (photographs, photomontages and wirelines) using the WindPro software in accordance with NatureScot Visual Representation of Wind Farms (2017). Mitigation measures will be proposed.
6	Shadow Flicker	The WPP project has the potential to affect the receptors by shadow flicker, given that the site is surrounded by 3 small villages of which one partially falls within the shadow flicker area of influence of the candidate turbine.	A Study Area of ten rotor diameters (1,700m) around each proposed turbine will be established to meet the requirements of international best practice and identify all potential receptors. The potential receptors positions will be identified by using the national GIS database GeoSrbija. Both the worst-case and real-case shadow flicker models will be developed using the commercial WindPro software. The predicted effects will be evaluated for each receptor.

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
			A field survey will be undertaken to inspect the receptors predicted to be effected by more than 30 hours of worst-case shadow flicker per year. Mitigation measures will be proposed.

Table 4-2 Summary of Level Two Issues

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
7	Socio-economic	Any acquisition of privately owned land, especially land that is being used for agriculture, may have severe impacts on livelihoods of individuals and their households and needs to be thoroughly investigated in the ESIA process. Although some of the impacts may affect only a small number of people and in that sense may be considered negligible, the impact on any one individual and his/ her household could be significant. This refers to both positive impacts (e.g., the importance of new employment for a household or income from easements) and negative impacts (e.g., the involvement of community members in project related accidents). These risks and impacts, if not addressed appropriately, could cause severe tensions between the project and the local communities. The importance of any development such as the proposed WPP, in an underdeveloped municipality such as Kovin and the associated generation of revenue, is extremely high for the local government and the local communities.	All land acquisition data and plans will be analysed in detail and a focused land acquisition survey will be undertaken, taking into account IFC PS5 requirements, with a sample of effected landowners, to determine if compensation is being provided at full replacement cost and if livelihoods may be affected. During the survey interviews, people farming land in the effected area, as well as local community representatives (Bavanište, Mramorak and Dolovo village) will be asked about the possibility of occurrence of other impacts during construction and proposals for their management, in line with IFC PS1 requirements. Valuable experience from the development of WPP Čibuk 1 will be taken into account. Other identified stakeholders will be consulted during the development of the ESIA, to determine if any other impacts are likely to occur during the construction and/or operation stage of the project and how they should be managed, in accordance with IFC PS1 requirements. Apart from directly effected people and community representatives, this potentially includes hunting organisations active in the area, as well as organisations involved in environmental protection. Engagement with stakeholders will be carried out in accordance with IFC PS1 requirements and the guidance note 'Stakeholder Engagement: A Good Practice Handbook for Companies Doing Business in Emerging Markets' (2007). More details will be provided in the Project Stakeholder Engagement Plan.
8	Traffic and Transport Impact	Transportation and delivery of the WTG components and construction materials may cause occasional disruption on local	A desk-based assessment of transport and traffic impacts will follow the Guidelines for the Assessment of Road Traffic (UK IEMA, 1993) to: • Establish the baseline traffic conditions along the routes (abnormal load transport and construction material transport),

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
		roads and may affect the safety of road users. These issues will be at their most intensive during the period of several months and can be readily mitigated by appropriate management measures.	• Estimate the traffic levels likely to be generated during the construction phase, • Conduct qualitative assessment of potential impacts, and • Propose control and mitigation measures. • A route survey report for large WTG components will be considered in the ESIA.
9	Operational Noise	Operational noise can cause a loss in amenity and therefore operational noise levels must be controlled to acceptable limits	An operational noise impact assessment will be carried out for the WPP in accordance with the relevant national and international guidelines. Separate noise limits will be applied for the consideration of daytime and night-time impacts. During the night, the protection of external amenity becomes less important and the emphasis will be on preventing sleep disturbance. A baseline noise survey will be undertaken at key representative locations of noise sensitive receptors. Five locations: have been identified, representing the nearest settlements as follows: Mramorak, Dolovo, Bavanište and Bavanište Monastery. Two locations are chosen for Mramorak. The location on the east side will be used to assess noise levels from the existing wind farm. A minimum of two weeks monitoring will be required to ensure that the noise data encompasses a range of wind speeds and wind directions during both the daytime and night-time. Ideally, access to residential properties will be required so that the noise monitors can left unattended for the minimum two-week period. The methodology for the noise survey is presented in Appendix Six of this Scoping Study report. The survey will be carried out in combination with anemometry measurements to determine the wind speed at the proposed turbine hub height. The wind speed measurements will then be standardised to a reference height of 10m above ground. Turbine noise levels also vary in relation to the wind speed and the turbine noise levels referenced to standardised wind speeds at 10m height will be compared to the baseline noise data. Noise limits which vary with wind speed can then be determined in relation to the background noise levels and with reference to Serbian and international guidelines including the IFC EHS Guidelines. The impact of the WPP will be assessed with operational noise levels predicted using computer modelling software. The assessment will consider all relevant noise sources and their nature (levels and frequency spectra). A cumulative assessment will be made considering the existing Čibuk 1 wind farm. Other wind farms in the area may also need to be studied. Noise propagation will be modelled in accordance with International Standard ISO 9613-2: 1996 Acoustics – Attenuation of Sound Propagation Outdoors – Part 2: General Method of Calculation. This will be implemented using a computer model. Input parameters and limitations for the ISO 9613-2 parameters will be chosen with reference

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
			to the recommendations of the UK Institute of Acoustics Good Practice Guide. This will ensure realistic predictions of turbine noise levels. The detailed analysis of measurement data, software model calculations and existing input data will provide sufficient information to estimate if mitigation measures are required. Mitigation can be employed by operating the turbines in a low noise mode, albeit with some loss of electrical power. The turbines should will also be fitted with embedded mitigation, such as using serrated trailing edges fitted to the turbine blades to ensure that noise levels are as low as possible (without loss of power).

Table 4-3 Summary of Level Three Issues

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
10	Ecology and Nature Conservation – Species other than Birds and Bats, Habitats	Potential impacts not likely to be significant except possibly at the local scale. Protected species and habitats possibly present within the WPP site.	Limited survey work is required over a one-year period to ensure that a sufficient impact assessment and mitigation strategy can be developed within the ESIA. Habitats, flora and fauna (other than birds and bats) surveys will include: • Desk studies, • Walkover surveys (driven and walking). The surveys will be undertaken in compliance with IFC PS 1 & 6, IFC EHS Guidelines for Wind Energy, compatible IFC and EBRD implementation guidance (IFC 2012, EBRD 2016. Gullison et al. 2015, Hardner et al. 2015) and European Commission (2020) guidelines. Following completion of surveys, an assessment will be carried out as part of the ESIA to determine impacts and their significance, following PS6 Guidance Note (IFC 2012), CIEEM (2016) and European Commission (2020) guidance. The significance will be based on the relationship between receptor sensitivity and impact magnitude. Appropriate mitigation will then be developed to reduce any adverse impacts and enhance any beneficial, as applicable.
11	Noise during construction and decommissioning	Construction noise can sometimes be audible but is generally for a limited duration and only takes place during normal working hours.	Construction noise impacts will be managed within the CESMP. This must include mitigation measures and procedures for dealing with complaints. Any especially noisy activities such as blasting must be identified. The need for out-of-hours working must also be considered. Noise effects from the transportation of construction materials and turbine components can be managed in the Traffic Management plan.
12	Archaeology and Cultural Heritage	During the construction phase there is the potential to have a direct and permanent impact on unknown archaeological features within the site. The wider site	Pre-construction archaeological field survey will be undertaken by the Institute for Cultural Heritage in Pančevo which will set the terms and conditions for the construction phase. The survey findings will be referenced in the ESIA.

Ref. No.	Key Issues for the ESIA	Rationale for the Assessment Level	Assessment Standard or Methodology
		area has presence of archaeological features.	Mitigation and management measures will be proposed to ensure that the Institute's requirements are properly implemented.
13	Surface Water and Effluent	The identified impacts of surface water can be readily managed and mitigated as an integral part of the design and construction process.	A desk-based qualitative assessment of surface water impacts will be undertaken to identify drainage patterns, areas vulnerable to erosion or sediment deposition and pollution risks. Where appropriate, additional mitigation measures will be identified prior to determining the likely significance of residual effects.
14	Land and Groundwater	The key impacts on land and groundwater may occur during the WPP construction. The impacts during the operational and decommissioning phases are considered to be less significant.	A desk-based assessment will be undertaken and the potential of the earth works to affect the local groundwater aquifer will be assessed. The need for additional water abstraction to service the construction of the WPP will be considered. Mitigation measures will be proposed.
15	Aviation Safety and Radar Physical Obstructions	Serbian civil aviation regulator will provide their conditions during the statutory consultation for the Zoning Plan and the Location Conditions. This will include requirements for obstruction lighting and marking of turbines.	Subsequent consultation with the statutory stakeholders will be followed and referenced in the ESIA.
16	Electromagnetic Interference and Radio Communication	Consultation with broadcast and telecommunication stakeholders has not identified any constraints for the project.	Subsequent consultation with the statutory stakeholders will be followed and referenced in the ESIA.
17	Ecosystem Services	Potential impact on ecosystem services will be limited and short-term, and readily mitigated by appropriate management measures and compensation.	Stakeholder consultations will determine the ecosystem service beneficiaries and the extent to which they benefit from the services provided. If any priority ecosystem services are identified, a range of measures will be proposed to minimise, compensate or offset potential adverse impacts on the effected people.
18	Air Quality	The measures to control dust and exhaust emissions during the WPP construction are part of the good construction practice commonly used at construction sites.	A desk-based qualitative assessment will be done in the ESIA and control and mitigation measures proposed.
19	Community Health Safety and Security	The WPP site is situated in a moderately populated area, surrounded by three small villages (1km away). The potential health, safety and security issues are related to traffic safety, blade and ice throw risks, fire risk, and public access.	A qualitative risk assessment concerning the potential risks to the general public and workers associated with the construction and operation of the WPP.

5 Technical Description of Čibuk 2

Čibuk 2 is the second phase of the Čibuk Wind Power Plant. Construction of the Čibuk 1 began in the summer of 2017 and the facility began commercial operation in April 2019. The development of a more extensive WPP was part of the original design concept and the Čibuk 1 transformer compound is large enough to accommodate transformers for Čibuk 2 and Čibuk 3. No additional land plots are required. Both the Čibuk 1 and Čibuk 2 will connect to the national electricity grid via the existing OHL and the construction of a new OHL will not be required.

The Čibuk 1 management team are still in place and the experience gained during the construction of Čibuk 1 will be applied carefully to the construction of Čibuk 2. This experience ranges from the management of concrete wash-out pits, through the avoidance of damage to agricultural land to communication with farmers and local residents. Section 5.6 incudes photographs that were taken during the construction of C1 to illustrate the construction activities that will be undertaken.

This chapter also provides an outline description of the Čibuk 1 WPP to provide the context for the Čibuk 2 development.

5.1 Context of the Existing Čibuk 1 WPP

The Čibuk 1 WPP comprises 57 x 2.78MW wind turbines, giving a total capacity of 158 MW. The total site covers approximately 37 km^2 or 3,700 hectares. The layout and the boundary of Čibuk 1 is shown in Figure 5-5. The total height of each wind turbine generator ("WTG") is 170m, this includes the height of the tower to the hub plus the length of a blade. The Čibuk 1 WTGs are 110m at the hub; each blade is 59m long.

In addition to the WTGs, the following infrastructure has been constructed:

- A network of access tracks that provide safe, year-round access to every turbine. These tracks will remain open for public use by farmers and the local community.
- An underground electrical network with a medium voltage of 35 kV which connects the turbines with the substation.
- A 35/400kV, 2 x 90 MVA substation.
- A 10 km-long high-voltage power line (400kV) connecting the transformer station and the overhead power line (400kV) at Bavanište.
- Telecommunications cabling across the site to relay data from the turbines to the control centre.
- A Control Building that houses the WPP control room, metering and control equipment, telecommunications equipment, office accommodation, and a secure compound for the temporary storage of material and equipment supplies.

The operation of the Čibuk 1 WPP is managed from the Control Building. The Control Building is located within the transformer station compound and it has been designed to meet the long-term operational needs of the WPP, including the development of Čibuk 2. The building also houses low voltage transformers, switchgear (20 KV and 35 KV). See Figure 5-1, below.

In compliance with the Energy Permit, WEBG employ a small team of WPP operators who are based in the on-site Control Building. The management of the individual WTGs is largely automated and the role of the WPP operators is to ensure the safe and efficient operation of the WPP.

The WTGs are maintained by the equipment supplier, General Electric ("GE"). As GE maintain several WPPs in the region, their technicians operate from a regional Service Centre located near Belgrade. GE also provide 24/7 remote monitoring of WTG condition and operation from their European service centre.

The Balance of Plant ("BoP") maintenance is provided by New Energy Solutions ("NES") who are based in New Belgrade. The BoP Contractor engage specialist subcontractors in line with the planned maintenance schedule.

Figure 5-1 Čibuk Control Building and Electrical Compound

Figure 5-2 Čibuk 1 Turbines

Figure 5-3 Čibuk 1 Access Track and Turbines

Figure 5-4 Čibuk 1 WTG 60 with its maintenance pad

5.2 Layout of Čibuk 2

Čibuk 2 will be located just to the south-east of the existing Čibuk 1 WPP. The Čibuk 2 WPP will cover an area of about 4,750 ha or 47.5 km^2. Each WTG requires the use of 3,500 m^2 (8.75 ha in total) and this land will be occupied during construction and will remain occupied during operation for maintenance pads.

Čibuk 2 will include up to 25 WTGs with a maximum total installed capacity of 155 MW. Figure 5-5 shows the layout and boundary of Čibuk WPP as a whole. The C1 turbines are shown in blue (to the north), the C2 turbines are shown in red and the C3 turbines (shown in yellow) are towards the centre of the C2 site.

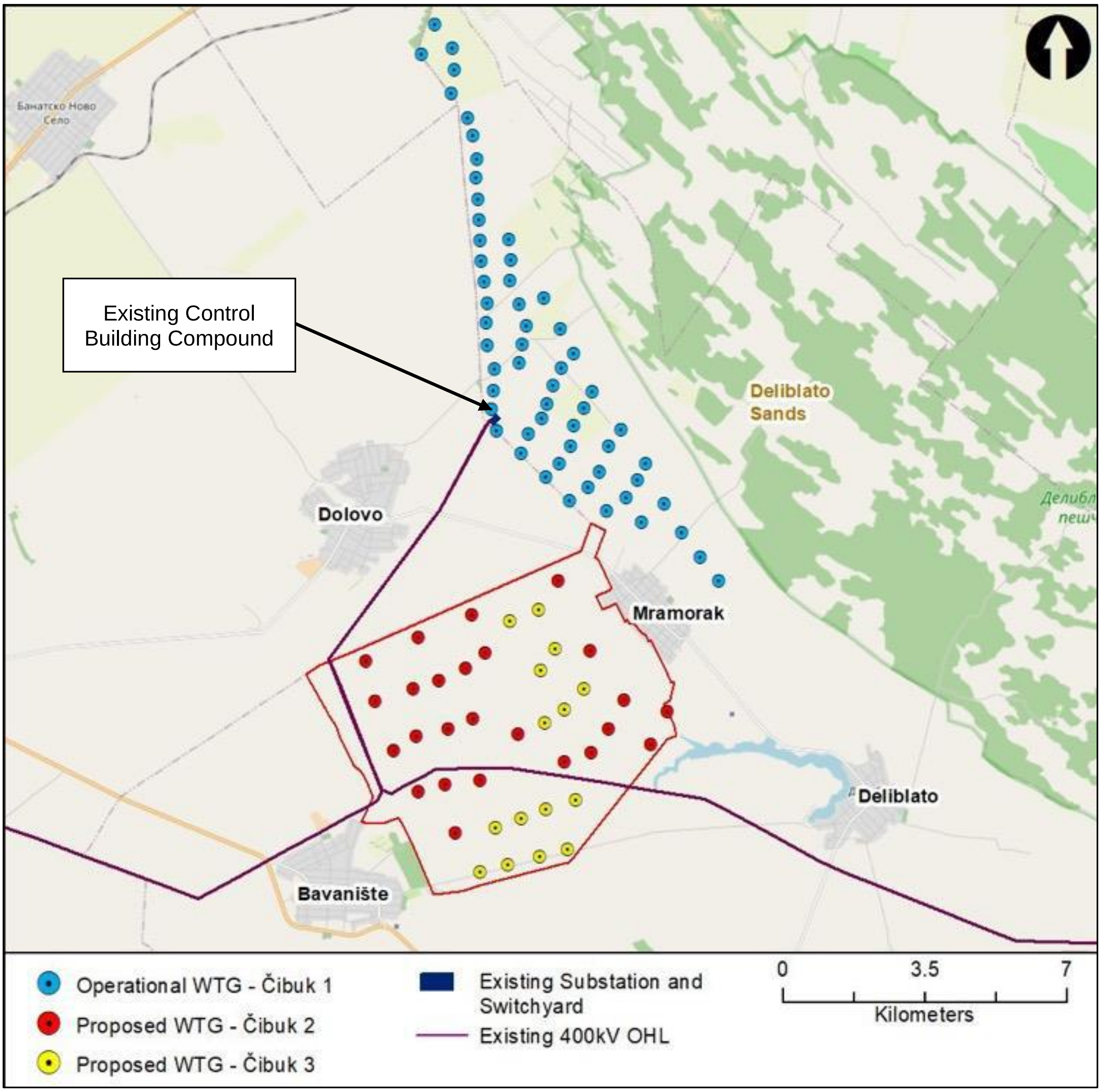

Figure 5-5 Layout of the Čibuk WPP (showing C1, C2 and C3 WTGs)

The Čibuk 2 site is crossed by a 400kV power transmission line in an East-West direction (coloured purple in Figure 5-5). The Overhead Line ("OHL") running to the south-east of Dolovo is the interconnector from the EMS switchyard and transformer station to the 400 kV OHL.

A more detailed layout of the Čibuk 2 WTGs is shown in Figure 5-6, below.

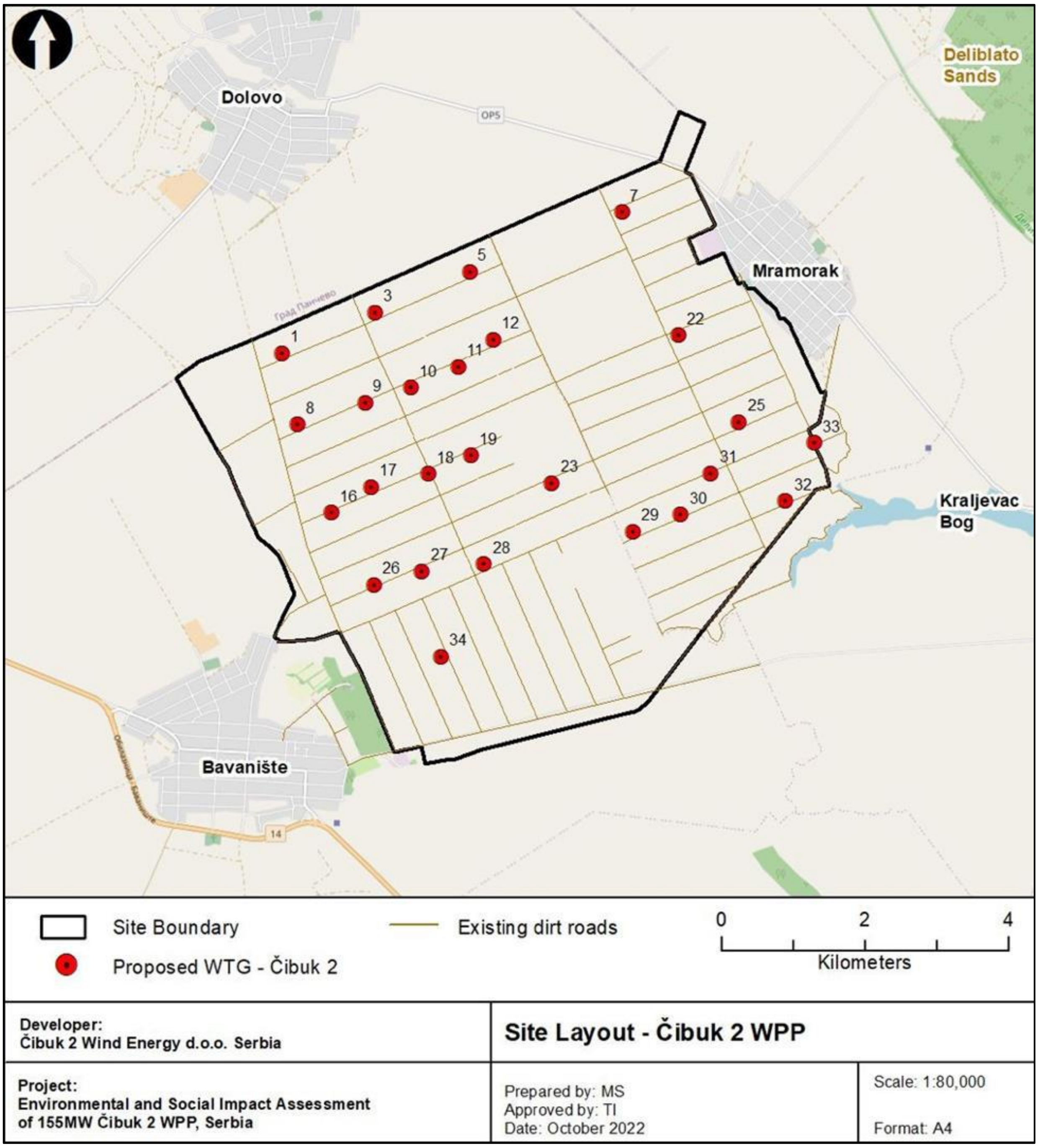

Figure 5-6 WTG layout for Čibuk 2

A Google Maps image of the Control Building compound and the alignment of the OHLs is shown in Figure 5-7, below.

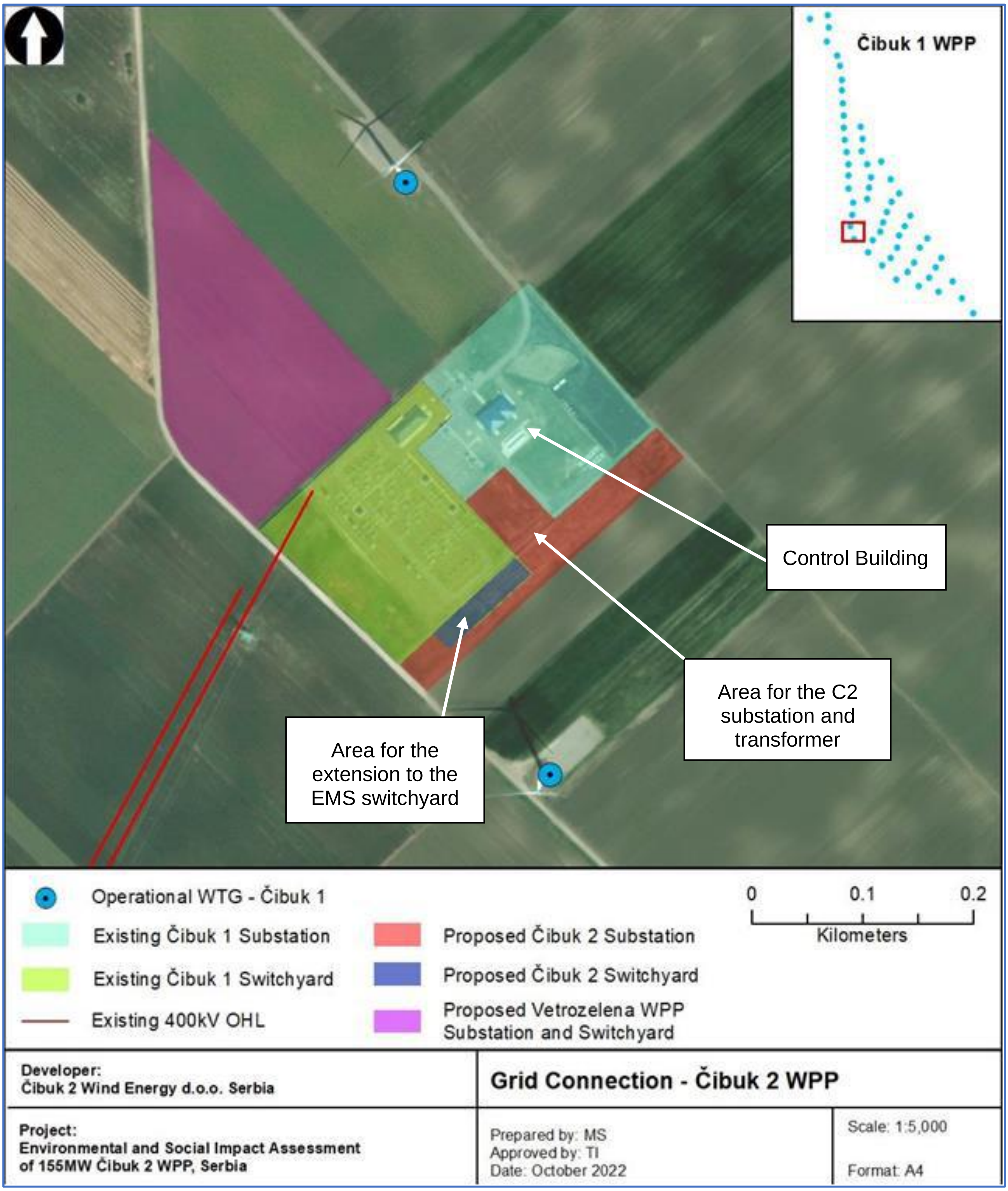

Figure 5-7 Čibuk WPP Control Building compound and grid connection

The land parcels acquired for the Čibuk 2 substation, the Čibuk 2 transformer, and the land that EMS will need to extend the existing switchyards are shown in brown. Figure 5-8 shows the proposed location of the C2 substation and transformer (items 2 and 3).

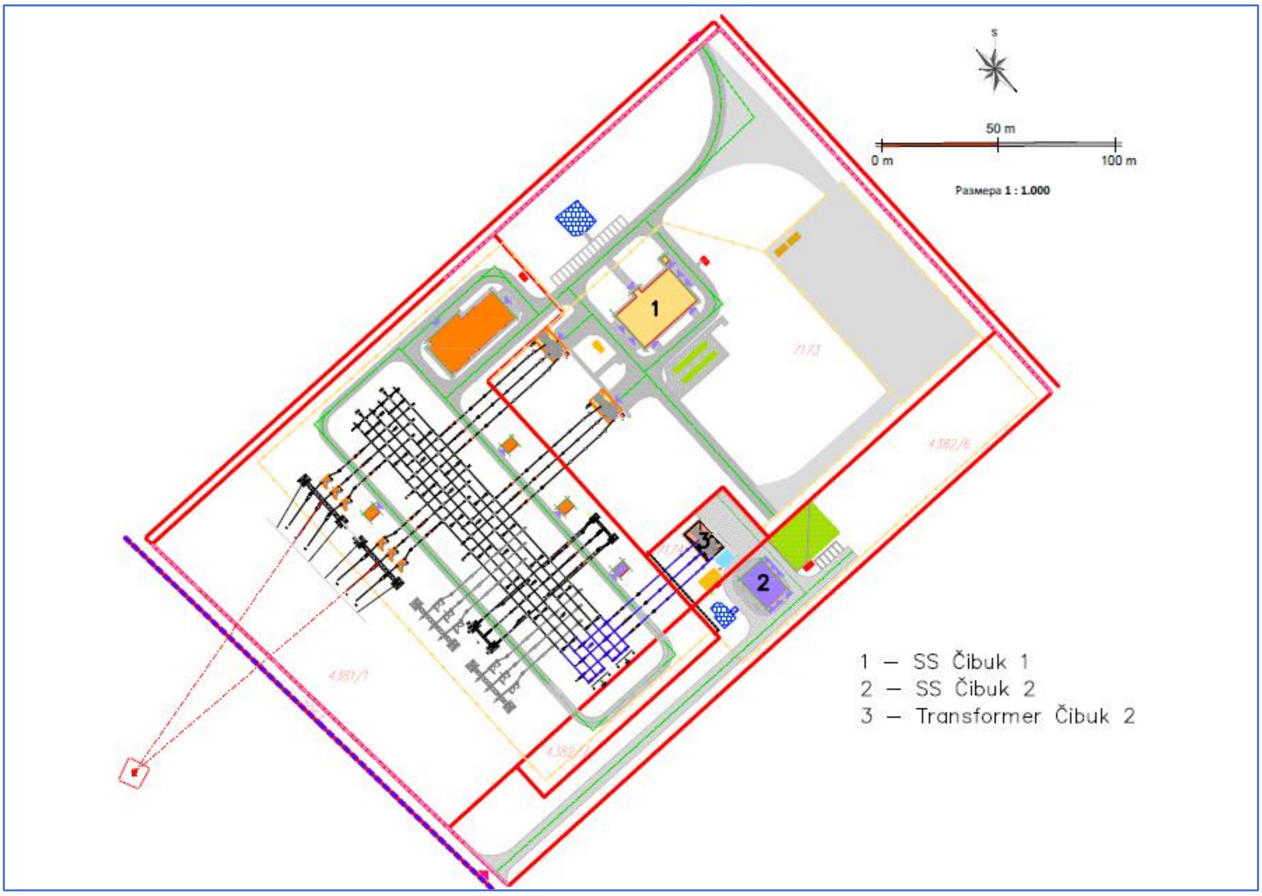

Figure 5-8 Location of the Čibuk 2 Substation and Transformer

5.3 Main Plant and Equipment

5.3.1 Generation of Electricity by Wind Turbine

The five basic steps of electricity production from wind power plants are:

- Wind turbine blades are turned by the power of the wind;
- the blades turn a rotating generator in the nacelle which converts wind energy to electricity;
- a transformer in the base of the turbine tower increases the electricity voltage for transmission to the substation by underground cables;
- the substation increases voltage for transmission over long distances;
- the electricity is transferred to the grid and distributed to the power users.

WTGs consist of a hollow steel tower topped with a nacelle and its rotating blades. The nacelle houses the main mechanical components of the turbine including the generator and the gearbox. The turbine transformer and the main control equipment are in the base of the tower. The tower is bolted to substantial concrete foundations. See Figure 5-9.

Commercial scale WTGs comprise a three-bladed rotor. Each blade is typically constructed from fibreglass reinforced epoxy resin. Lightning protection is generally incorporated into the blades, with receptors located at multiple points along the blade length. Turbine blades have a similar profile to the wing of an aeroplane and are also twisted as they extend from the rotor to the blade tip. The wind travelling along the curved side takes longer to reach the end of the blade than that which travels along the flat surface. This leads to low pressure accumulating at the curved side, 'pulling' the blade to the region of low pressure. This pressure difference is what causes the blades to turn.

A WTG tower typically comprises several tubular steel sections (usually 3 or 4). Each section is transported to site separately. The bottom section of the tower is bolted to the foundation ring and each additional section is lifted into place using a large crane. Each section is bolted to the one below.

Once the tower is completed the nacelle is lifted into place. The hub, with its blades, are then lifted and attached to the nacelle.

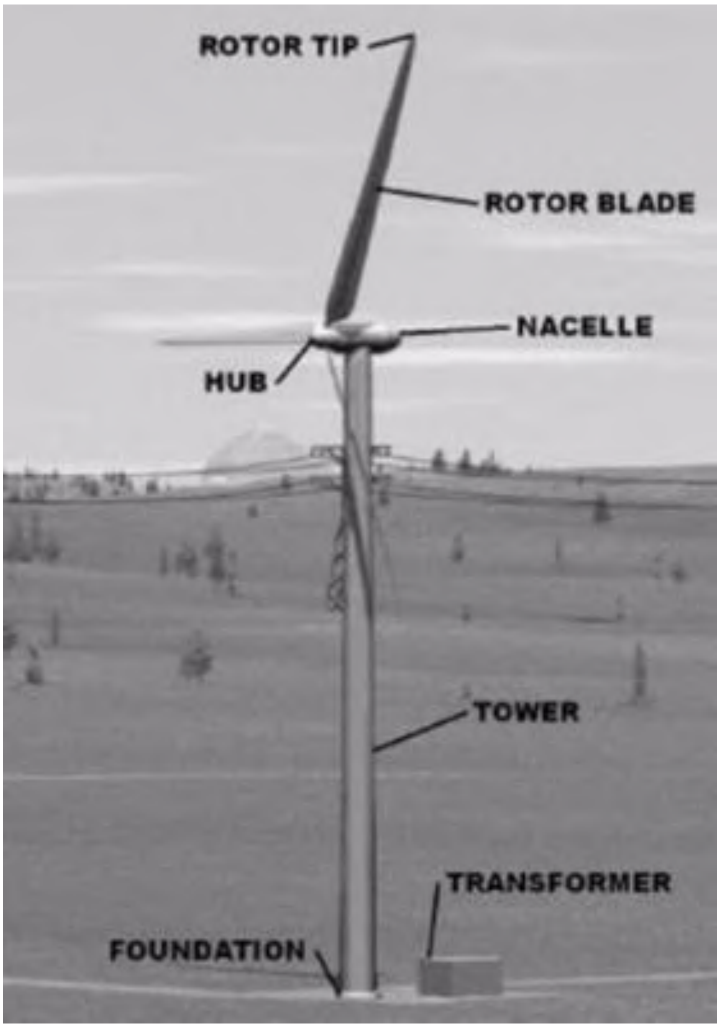

Figure 5-9 Main Elements of a Wind Turbine Generator

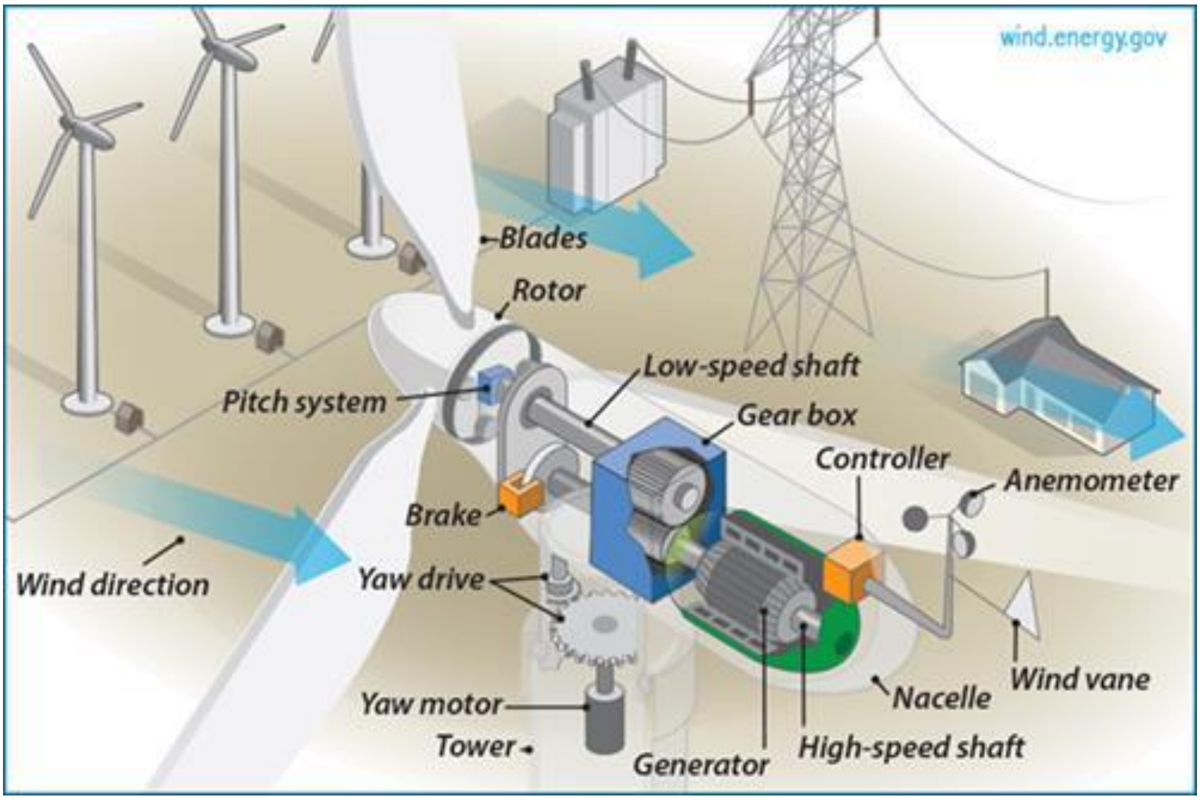

Figure 5-10 Generic Wind Turbine Generator

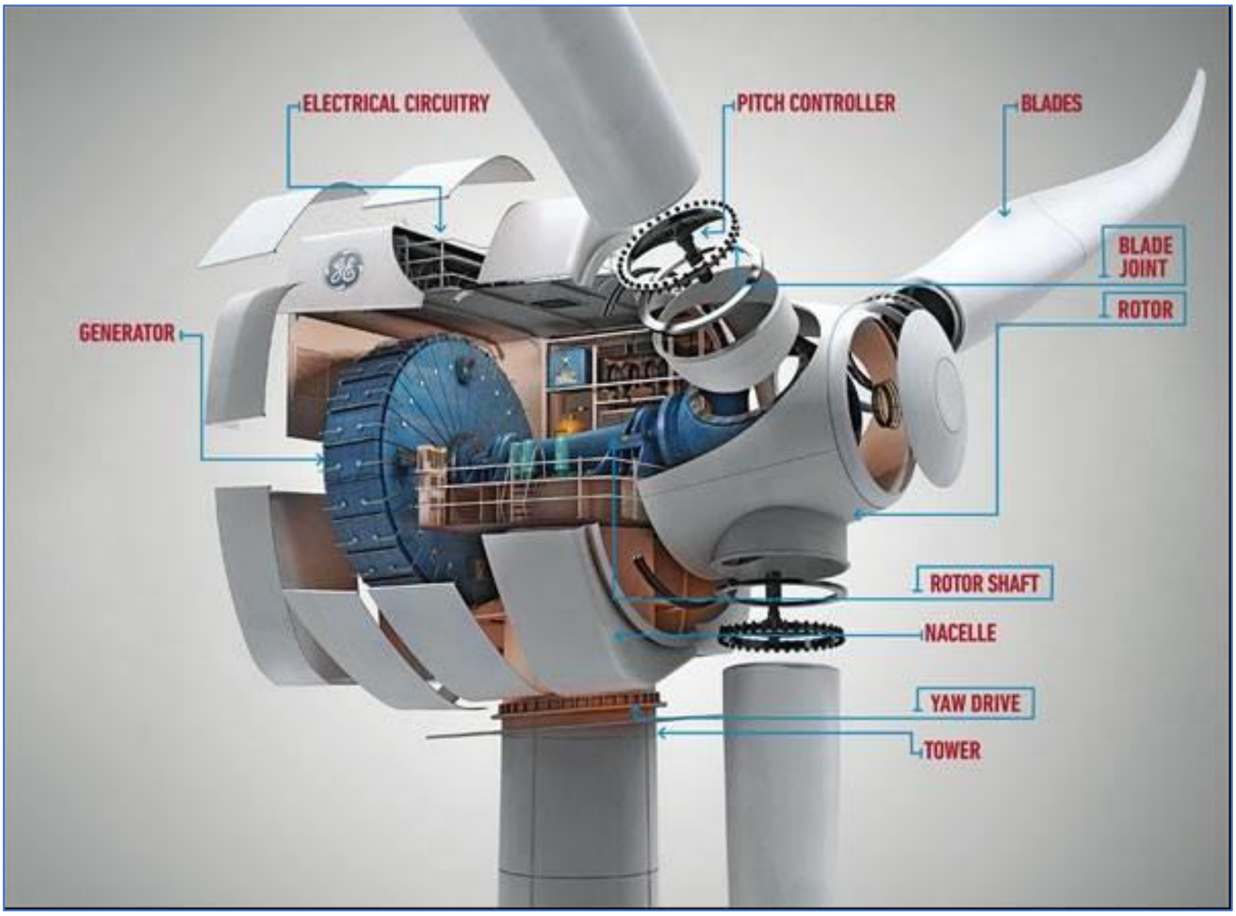

Figure 5-11 Elements of a WTG Nacelle (Source: GE)

The turbine nacelle is rotated by the yaw motor so that the rotor points directly towards the wind (i.e., perpendicular to the direction of the wind), see Figure 5-10 and Figure 5-11. This is in the same way that the sails on a boat are oriented towards the wind by the crew. The direction of the wind is sensed by the wind vane and the wind speed is monitored by the anemometer. The WPP also has a tall mast where the meteorological sensors are mounted. This mast is typically much taller than the turbines.

When the wind reaches and maintains constant speeds of over 3 m/s, the turbine rotor will start to rotate in a clockwise direction. The wind speed that starts the blades moving is called the cut-in speed. The rotor shaft slowly drives the gearbox that converts the mechanical energy into electrical energy through an electrical generator (which spins at a much higher speed than the rotor).

At a constant wind speed of 3 m/s each turbine will generate about 20kW. At 6 m/s, the output is about 0.6MW but this rises sharply to the maximum power output at a wind speed of 10 to 12 m/s, when the turbine will generate the design or rated power, 5 to 6.1MW in this case.

The pitch control system alters the angle of the blades. This allows the blades to find the best angle, to deliver a safe steady rotation of the blades. The turbine's electronic controller checks the power output of the turbine several times per second and if the power becomes too high, the pitch mechanism will pitch (turn) the blades slightly out of the wind. Conversely, if the power becomes too low, the pitch mechanism will pitch the blades back into the wind.

At wind speeds above 25 m/s, the turbine blades are stopped by the control systems to prevent excessive wear and tear on the mechanisms. This is called the cut-out speed. The blades are stopped by the pitch control system which rotates the blades on the hub. This change of blade angle (the pitch of the blades, see Figure 5-11) means that the blades are no longer driven by the wind; a process called "feathering" the blades.

Whilst the tip of the blades can move very fast (160 to 200 kph) the hub itself rotates relatively slowly at 15 to 20 rpm. The low-speed (hub) shaft is connected to a gearbox. The gearbox increases the rotational speed of the shaft by a factor or 9 or 10 (1200-1800 rpm) in order to produce useful levels of power. The gearbox transfers the energy through a fast shaft to a generator.

In summary:

- The rotor rotates at the same speed as the blades and is connected to a low-speed shaft which rotates at the same speed.
- The rotational speed of the low-speed shaft is increased substantially by the gearbox which is connected to the high-speed shaft which rotates much faster than the low-speed shaft.
- The high-speed shaft is attached to a coil of copper known as an armature inside the generator. The armature rotates at the same speed as the high-speed shaft.
- The armature is surrounded by a magnetic field, created by magnets within the generator. As the armature rotates through the magnetic field, a current is induced in the copper coil.
- The electricity generated in the copper coil is then fed from the generator to the on-site sub-station.

Most of the electricity produced by the wind power plant will be transferred to the grid but a small amount of electricity is used by the turbines (e.g. the yaw motor and pitch controls) and on-site control facilities. The turbines are connected on site by a medium voltage power collection system. At the WPP sub-station, this medium voltage electrical current is increased in voltage by a transformer prior to connection to the high voltage transmission system.

5.3.2 Turbine Selection

The selection of a site with a significant wind resource is critical to the development of a successful wind power plant. Wind turbines are most efficient when the wind speed is high. Developers invest a lot of time and effort in the identification of potentially suitable sites and will install large masts to collect meteorological data at a preferred site.

The next critical decision relates to the size and generation capacity of the individual turbines. In general, increasing the tower height means that the blades will be exposed to higher, less turbulent wind speeds, and will generate the most electricity. As a consequence, turbine manufacturers are focussed on increasing the size of individual turbines, both hub height and blade length, to achieve higher levels of electricity production. The increasing availability of taller, higher capacity turbines has meant that design power outputs for a given wind power plant can be achieved with fewer turbines.

It is now more than a decade since Čibuk 1 was designed. Turbine technology has progressed quickly and the new generation of turbines are bigger and more efficient at generating electrical energy. C2WE intend to use turbines with a nominal capacity of about 6.1MW for Čibuk 2. This means that the 155MW capacity of the WPP can be achieved with fewer than half the number of turbines required for Čibuk 1. See Table 5-1.

Table 5-1 Generation Capacity of Čibuk 1 and Čibuk 2

Project Phase	WTG Capacity, MW	Hub Height, m	Blade Length, m	Overall Height, m	No. of Turbines	WPP Capacity, MW
Čibuk 1	2.78	110	59	170	57	158
Čibuk 2	6.1	151	79	240	25	153

During the initial design phase of C2, C2WE considered four turbine suppliers, see Table 5-1, below. This table illustrates the variation in generating capacity and physical dimensions of the WTGs being offered by suppliers.

Table 5-2 Potential WTG Suppliers and Models

Potential Supplier	WTG Generating Capacity (MW)	Overall Rotor Diameter (m)	WTG Hub Height (m)	Overall WTG Height (m)
General Electric (GE)	6.1	158	151	230
Nordex	5.7	163	107.5	189
Siemens Gamesa (SG)	6.2	170	165.0	250
Vestas	5.6	162	125.0	206
Zoning Plan limits (m)		**190**	**160**	**240**

When comparing the dimensions of these turbines with the requirements of the Zoning Plan, it can be seen that the turbine being offered by Siemens Gamesa exceeds the allowable maximum hub, and overall heights. This unit has therefore been dropped from the list of possible turbines.

Having made a technical and value for money assessment of the shortlisted turbines, C2WE have designated the GE 6.1MW 158 – 151 m HH unit as the preferred WTG (the “Candidate” WTG). The landscape, shadow flicker, noise and Collision Risk models have been based on the dimensions and characteristics of this unit. The physical dimensions of the GE 6.1MW 158 – 151 m HH are shown in Table 5-3, below.

Table 5-3 Dimensions of the Candidate WTG

GE 6.1-158 Dimensions	metres
Rotor diameter (max)	158
Hub height (max)	151
Overall height (max)	230

The cut-in wind speed of the GE 6.1MW 158 is 3 m/s and the cut-out wind speed is 25 m/s. The maximum rotor speed is 12.1 rpm.

5.3.3 Site Entrance, Access Tracks and Security

The site will be accessed from the municipal road Dolovo - Mramorak in the north-east and the state road No. 14 and a municipal road near Bavanište in the south. The Čibuk 1 Control Building Compound can be accessed from the village of Dolovo (Detelinska Street).

The site is crossed by a network of tracks that are used by the farmers to access their land. These tracks are open for public use but will be upgraded to provide access to the WTG locations during construction and then for maintenance vehicles during the operational life of the WPP.

The total length of the site tracks is expected to be around 57km. It is expected that the C2 tracks will be constructed from crushed stone. The site tracks will be 4 to 6m wide.

Communication links between each wind turbine, the meteorological mast and the control building/ substation will also be buried in trenches alongside the site access tracks.

5.3.4 Control Building, Cabling, Transformers, Sub-station and Grid Connection

Both the C2 turbines will be monitored from a new control room in the new, C2 substation building (see Figure 5-12), although the basic operation of each turbine is controlled by its' own computer systems. The Control Building is located within the transformer station compound and it has been designed to meet the long-term operational needs of the WPP. In addition to the WPP Control Room itself, the building includes administrative offices, workshops, storerooms and welfare facilities. The building also houses low voltage transformers, switchgear (20 KV and 35 KV).

A new transformer and substation will be installed to serve Čibuk 2. The Čibuk 2 turbines will be connected to the Čibuk 2 Substation by 33(35)kV underground cable. Both the Čibuk 1 and Čibuk 2 WPPs will connect to the existing EMS switchyard and then to the national electricity grid via the existing OHL; construction of a new OHL will not be required (see Figure 5-12).

Figure 5-12 Čibuk Control Building Compound

The additional infrastructure required for Čibuk 2 will be limited to:

- Access tracks: Upgrading the existing access tracks in order to link the WTGs to the infrastructure on the site. The existing tracks will be surfaced with crushed stone.
- Underground cables: The cables taking power to the sub-station will be buried in trenches running alongside the site access tracks. Communication links between each wind turbine, the meteorological mast and the control building/ substation will also be buried in trenches alongside the site access tracks.
- Areas of hardstanding: Each turbine would require a work area to accommodate the crane and turbine components during construction and operation (the "maintenance pad").

5.4 Summary of WPP Components

Table 5-4 provides a summary of Čibuk 2 components and the equipment or materials that will be transported to site.

Table 5-4 Summary of WPP Components

Component	Description	Materials required
Wind Turbine Generators	Each WTG requires a reinforced concrete foundation suitable to the size of the turbine, the ground conditions, and the stresses that will be placed on the tower.	The main electrical and control equipment is likely to be manufactured in Europe. The WTG towers and the fibreglass blades can be sourced world-wide. The nacelle will include the rotor, gearbox, generator, yaw motors and control equipment. The sectional tower includes earthing/ copper rope, power and optical cable, SCADA control equipment, heating ventilation and air conditioning equipment, thermal insulation, lighting, and security equipment. The foundations will be constructed on site from concrete with reinforcement steel.
On-site substation - transformer station	The WTGs will be connected by 33(35)kV underground cables (about 36km) to a new transformer and substation next to the Čibuk 1 Control Building compound.	To be sourced from Serbia or Croatia depending on selected contractor.
Underground electrical cabling/ collection system	Medium voltage cables taking power to the sub-station will be buried in trenches running alongside the site access tracks. Communication links between each wind turbine, the meteorological mast and the control building/ substation will also be buried in trenches alongside the site access tracks.	To be sourced from Serbia or Croatia depending on selected contractor.
Site access tracks	A series of access tracks will be required to link the WTGs to the infrastructure on the site. Existing tracks will be upgraded and no new tracks are proposed. A total of 57km of access tracks.	Constructed using sand, gravel, and crushed stone obtained locally (Belgrade, Pančevo or possibly Novi Sad).
WTG maintenance pads	Each turbine would require a work area to accommodate the crane and turbine components during construction. The majority of this construction area will be removed once construction is complete. A maintenance pad (about 50m by 30m) will remain next to the base of each turbine.	Constructed using sand, gravel, and crushed stone obtained locally (Belgrade, Pančevo or possibly Novi Sad).

Each WTG will require substantial foundations. Each WTG foundation is likely to be about 500 m^2 and at least 3.5m deep. Piling will be required for some of the WTG foundations. The location of the concrete batch plant that will provide concrete for the foundations has not yet been established.

During the construction of Čibuk 1 a commercial supplier of concrete installed a mobile batching plant on a small site about 2km from the Control Building compound. This plant was operated and Permitted by the commercial company. This mobile batching plant was removed from site once construction was completed. It is not yet known if the same concrete supplier will be used for Čibuk 2. It is possible that the concrete required during the construction of Čibuk 2 will be sourced from a commercial batching plant from some of the nearby cities. If the mobile is reinstated, then it will be considered to be an Associated Facility (as defined by IFC guidance) and will be required to meet the operational and emissions standards described with the IFC Guidance for Concrete Manufacture.

The sand and crushed stone required for the tracks, pads and areas of hardstanding will be sourced from local, commercial suppliers (Belgrade, Pančevo or possibly Novi Sad) and there is no requirement to create on-site quarries or borrow pits.

5.5 Assessment of WPP Design

5.5.1 Constraints Analysis

Design change is the primary mitigation for all WPP projects. This section considers the constraints that could impact the layout of Čibuk 2 and what mitigations might be needed. Specific consideration has been given to:

- Lender guidance;
- Permit conditions;
- proximity to existing oil and gas facilities and equipment;
- proximity to protected areas and protected species, in particular the Saker Falcon;
- proximity and the possible impact on human sensitive receptors, e.g. from noise and shadow flicker.

5.5.2 Lender Guidance

The IFC Environmental, Health, and Safety Guidelines for Wind Energy (2015) does not provide a description of Good International Industrial Practice ("GIIP") in terms of the design and mechanical performance of the WTGs. Rather, the Guidelines describe the potential impacts on WTGs on the natural environment and sensitive receptors such as local residents. Specifically, the Guidelines suggest that an ESIA for a WPP should consider environmental and social impacts such as:

- Landscape and Visual;
- Noise;
- Biodiversity;
- Shadow Flicker;
- Water Quality.

These topics are considered in detail in Chapters 9, 11, 12 and 13 of this ESIA report. The ESIA team considered how the design of Čibuk 2 might be modified to mitigate the possible impacts in each of these topic areas.

The IFC guidelines require the creation of safety zones around each turbine to mitigate the impact of ice throw, tower collapse, or fire. The suggested diameter of a safety zone is 1.5 x height to blade tip. For Čibuk 2, the Candidate turbine would require that the safety zone should have a diameter of 360m (1.5 x 240m).

- Whilst turbine fire is an extremely rare event, a very low residual risk remains. It is virtually impossible to extinguish a nacelle fire from the ground and the primary mitigation is to adopt a safety zone that will ensure that burning debris does not fall on buildings or nearby natural gas wells. A safety zone with a diameter of 345m is considered to be sufficient to mitigate tower collapse and fire risk.
- The ice throw safety distance for the candidate turbine GE Cypress 6.1-158 has been calculated based on the worst-case empirical scenario suggested by the IFC Environmental, Health, and Safety Guidelines for Wind Energy (2015). This "worst case" assessment gives a diameter of 477m.

The Čibuk 2 ESIA has adopted a safety zone of 500m.

The IFC Environmental, Health, and Safety Guidelines also suggest that the developer establishes a number of management plans and controls for the "routine" and predictable EHS risks that might be encountered during the construction, operation and decommissioning of a WPP. These plans and controls are described and managed through the project Environmental and Social Management System (ESMS). A project ESMS is already in place for Čibuk 1 and it is intended that this ESMS will be extended to include the construction and operation of Čibuk 2, see Section 15.1 of this ESIA report.

5.5.3 Zoning Plans and Location Conditions

A design mitigation strategy has been agreed with C2WE in the very early stages of the ESIA process. These design mitigations were implemented to minimise the impact on birds, bats and sensitive habitats.

A number of the spatial limitations have been established by the IfNC and these were implemented by C2WE as part of the application for the Zoning Plan. These limitations include:

- A 2km buffer zone IfNC along the south western boundary of Kraljevac SNR / Deliblato Sands IBA) to ensure that:
  - Destruction or degradation of habitats within the designated site was avoided;
  - possible negative effects on bird nesting (displacement and disturbance) within these habitats were avoided;
  - possible negative effects (disturbance and loss of habitats) on some of the important bat foraging and commuting habitats at the site were avoided;
  - risk of operational mortality was minimised for a number of bird species and most of the occurring bat species.
- Exclusion of woodland/ scrub, marshland/ wetland fragments and irrigation canals, including two segments designated as Ecological Corridors of Local Importance, had been excluded from development to ensure that:
  - Possible negative effects on bird nesting and resting (displacement and disturbance) within these fragments were minimised;
  - possible negative effects (disturbance and loss of habitats) on further important bat foraging and commuting habitats at the site (Figure 7 25) were avoided;
  - risk of operational mortality was further minimised for all of the occurring bat species.
- A 200m buffer zone either side of the existing OHL routes (i.e. 400 m wide) to ensure that:
  - Possible negative effects (displacement and disturbance) on nesting on pylons were minimised for a number of bird species;
  - bird collision risk is minimised (fledglings in particular).
- Most of the existing farm tracks will be used to construct the site access tracks in order to minimise the loss of farmland habitats.
- WTG blades must be painted in alternating red and white stripes to maximise visibility in different weather and light conditions, and thus collision risk reduced for all bird species.
- WTG foundations must be constructed and maintained so as to prevent burrowing of fossorial mammals (potential prey of raptors), and thus collision risk reduced for a number of valued bird species.

The Zoning Plan was adopted in June 2021 and allows for the construction of up to 41 WTGs with a maximum total installed capacity of 315 MW. The Zoning Plan application was based on the installation of 7.5 MW turbines. C2WE propose to construct no more than 40 turbines (up to 25 turbines at Čibuk 2 and up to 15 at Čibuk 3), each with a nominal capacity of 6.1 MW. The Zoning Plan provides the planning framework for both C2 and C3.

Based on the Zoning Plan, the Location conditions were issued for Čibuk 2 (but not C3) in July 2021 for maximum installed capacity of 155MW based on 25 turbines. The maximum height to blade tip was set at 240m, the maximum rotor diameter is 190m, maximum blade length is 95m, and maximum hub height is 160m.

The Location conditions are quite general (see Section 3.1.1) and include conditions relating to the painting of turbine blades, protection of archaeological finds and setback distance between the underground cable route and a drainage canal. In addition, the Location permit requires that:

- *To protect the migratory species, the WPP must be equipped for continual monitoring of bird and bat movements over the site area.*

- *The post-construction bird monitoring must be undertaken for a period of at least 1 year and must be particularly focused on Saker falcon (Falco cherrug) and the WPP site area within 1km of the Kraljevac Special Nature Reserve*.

The Location conditions do not represent any spatial constraint to the design of Čibuk 2 and they are included within the ESMMP (see Section 15.2). The ESMMP will be delivered through the Construction Environment and Social Management Plan (see Section 15.1.1) and the Operation Environment and Social Management Plan (see Section 15.1.2).

5.5.4 Existing Biogas and Natural Gas Facilities

Whilst the area is largely agricultural there is a biogas plant and three natural gas wells within the local area.

The biogas plants are located on the western edge of Mramorak. These units are small (2 x 1MW each) and are more than 1km distant from the closet turbines (WTGs 7 and 22, see Figure 5-13). A lined lagoon, used for storage of pumped liquid digestate from the biogas facilities is situated within the WPP site, c. 500m north of WTG 22. The lagoon is 164m long and 67m wide with the storage capacity of 11,500m^3. The digestate is spread on nearby cultivated fields. The location of the lagoon is shown in Figure 5-13.

The biogas plants are not within the 500m WTG safety zone and are not a constraint to the development of Čibuk 2. The lagoon is not considered to have any EHS implications for the development of Čibuk 2.

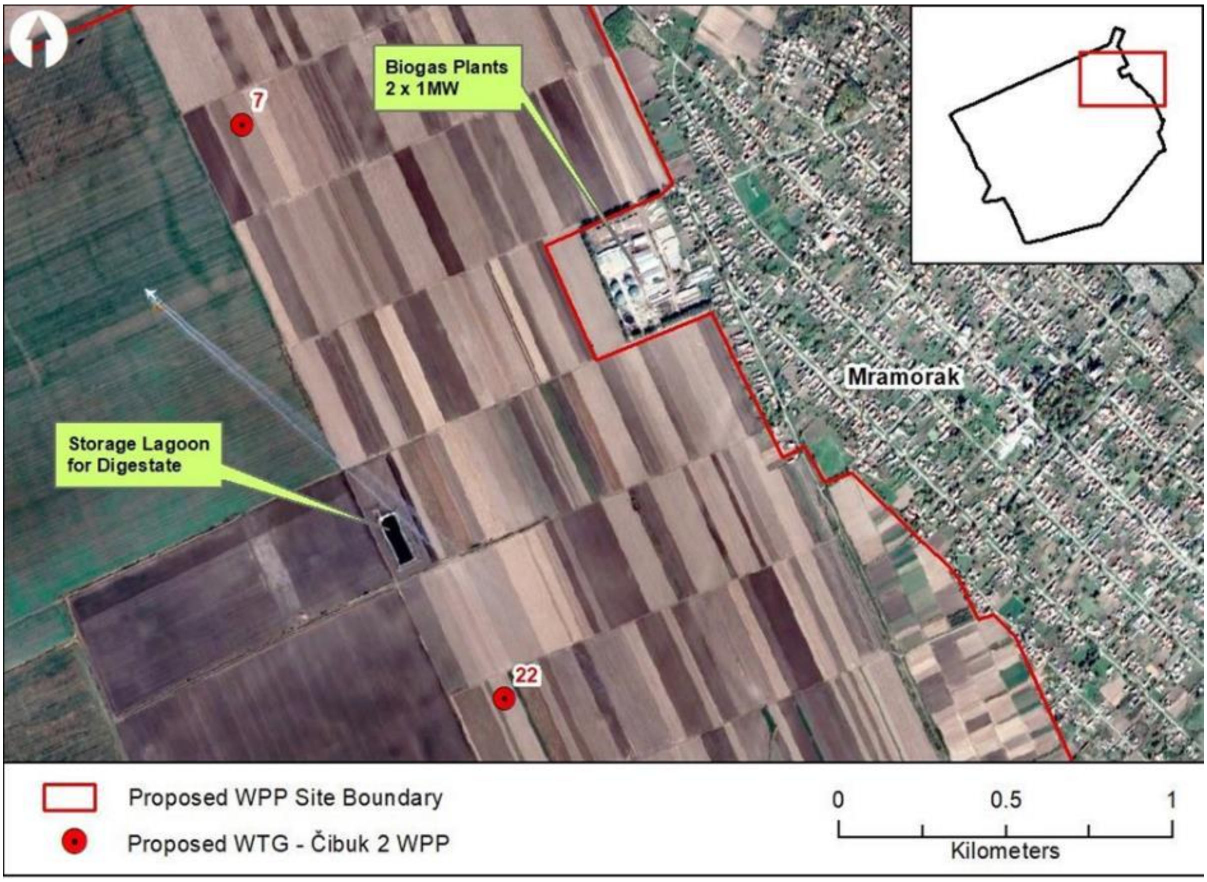

Figure 5-13 Location of Biogas Plants

The Serbian oil and gas producer (NIS) hold the exploration licence for oil and gas in an area in and around the Čibuk site. There are three, small natural gas wells close to the WPP but they are all more than 700m away from a WTG. It is noted that under Serbia law, a setback distance of 200m from each side of the gas pipeline is mandatory.

None of the biogas plants are within the 500m WTG safety zone and are not a constraint to the development of Čibuk 2.

5.5.5 Sensitive Human Receptors

There are no permanently occupied houses, and only one summer house, within the boundary of the WPP. The closest sensitive human receptors are the residents of the villages that surround the site. The following sections summarise the potential impact on sensitive human receptors from of noise and shadow flicker.

5.5.5.1 Shadow Flicker

The shadow flicker assessment suggests that the recommended worst-case threshold of 30 hours per annum could be exceeded at four permanently occupied houses on the south western edge of Mramorak village. These residential houses are predicted to experience between 31 and 40 hours of shadow flicker per annum from C2 WTG No. 22. Additionally, there are four permanently occupied houses in this area where the amount of shadow flicker is predicted to slightly excess the daily threshold of 30 minutes. The effect will occur from November to February between 3pm and 4pm.

In addition, four residential houses in northern Mramorak are predicted to be impacted by the cumulative shadow flicker with the Čibuk 1 and Vetrozelena WPPs.

The shadow flicker threshold will also be exceeded at another eight unoccupied structures; storage sheds, the biogas plant, crop warehouse and barn.

This impact assessment is considered to be conservative and no account was taken of the lower levels of sunlight during the winter months and any existing screening features (such as scrub growth or trees). It is therefore highly likely that the predicted impact of shadow flickering will be much lower.

For the permanently occupied houses (highly sensitive receptor) the shadow flicker impact is considered to be significant.

For the affected industrial and agricultural buildings as receptors of low to negligible sensitivity, the impact is not considered to be significant.

A number of mitigation options are available to mitigate the predicted impact of shadow flicker. There is no universal solution applicable to all receptors and some measures would require C2WE to work closely with the effected people. All mitigation measures can be applied or adjusted at the WPP operational phase. Provided that any potential shadow flicker effects can be mitigated through the implementation of the Shadow Flicker Management Plan, no significant residual effects are predicted during the operation of Čibuk 2.

The Shadow Flicker Management Plan would include:

- Provision of information to effected people on timing and duration of the effect;
- Procedure for addressing a complaint received from a receptor and how the shadow flicker occurrence should be verified and mitigation defined;
- Liaison with the Vetrozelena WPP to address potential complaints from affected receptors of cumulative shadow flicker;
- Mitigation measures (installation of screening structures or planting of vegetative buffers);
- Monitoring of mitigation effectiveness;
- Shut-down of individual turbines if measures prove to be ineffective.

5.5.5.2 Noise

The noise assessment has indicated that the noise levels that would be experienced at all of the at-risk properties will be within the Serbian day-time and night-time limits. However, at a small number of properties in Mramorak and Bavanište the predicted noise levels will exceed the IFC night-time noise limit (the WPP must not result in a maximum increase in background levels of 3dB at the nearest receptor location). This exceedance is due to the existing low background noise levels at night. At Bavanište it is possible that there will be night time exceedance at House 11A and the Monastery.

At Mramorak (but not Bavanište) the predicted exceedance at some locations (House 1C) is also due to a contribution from Čibuk 1 WTGs.

The Candidate turbine can be operated in a low noise mode. It will be possible to meet the IFC night-time noise limits by operating turbines W7, W22, W23, W25, W26, W27 and W34 in low noise mode. The mitigation would only need to be applied during the night (22.00 to 06.00) and then only to the wind speeds in excess of 6 and 7 m/s at 10 m height. However, as the likelihood of creating a noise nuisance is low, the low noise mode will be used in the event of complaints (and subsequent confirmation of any exceedance by noise monitoring).

However, as the likelihood of creating a noise nuisance is low, the low noise mode will be used in the event of complaints (and subsequent confirmation of any exceedance by noise monitoring). Because noise levels will remain relatively low in absolute terms, and below sleep disturbance thresholds and Serbian limits, it is proposed that the use of low noise mode would only occur following a justifiable complaint. Noise monitoring will be undertaken to evaluate any exceedance.

The ESMMP contains a requirement to monitor levels and to take remedial action should the noise levels cause justifiable complaints.

5.5.6 Impact Summary

The Assessment confirms that:

- There are no buildings or at-risk industrial installations within the WTG safety zone of 500m.
- WTG 22 is likely to breach the IFC guidelines on shadow flicker at eight, permanently occupied residential houses on the outskirts of Mramorak.
- It is possible that IFC night-time noise limits could be exceeded on the edge of Bavanište at House 11A and the Monastery, as well as House 1C in Mramorak. Should there be a noise complaint this will be investigated by the operator and noise monitoring will be undertaken where appropriate. If the complaint is justifiable, the operator will agree appropriate mitigation with the complainant. It will be possible to meet the IFC night-time noise limits by operating turbines W7, W22, W23, W25, W26, W27 and W34 in low noise mode.

The detailed assessments, and the associated suggested mitigations, are presented in Chapters 9, 11, 12 and 13 of this ESIA report.

5.6 Construction of Čibuk 2

It is the Developers current intention to appoint an Engineering, Procurement and Construction (“EPC”) contractor to construct the WPP on their behalf. It is likely that one or more separate contractors will also be employed to undertake the civil work including the construction of the WTG foundations, access roads and crane pads. Specialist contractors would be employed to construct the electrical sub-station and overhead power line to connect the WPP to the grid.

Construction activities will include:

- Surveying of the site.
- Installation of signage at the site entrance.
- Clearance of vegetation and/ or crops for:
  - Construction compound, including equipment and material storage areas.
  - Lay-down areas.
  - New access tracks.
- Upgrading of the site tracks to each WTG.
- Establishment of the construction compound (includes offices, welfare facilities, parking, secure stores for hazardous materials and wastes, storage areas for recyclables and non-hazardous wastes).
- Storage of construction materials and equipment in laydown areas.
- Operation of construction plant along the access roads and on the project site.
- Excavation and levelling of WTG pads and foundations.
- Storage of earthen materials.
- Installation of electrical infrastructure.
- Cement pouring (for WTG foundations).
- Installation of WTGs.
- Installation of the new transformer.
- Testing of the WTGs and new transformer.

- Commissioning the WPP and control systems.
- Landscaping the turbine bases.
- Final surfacing of the access tracks and maintenance pads.
- Removal of the construction compound and temporary lay-down areas (the land is to be restored to agricultural use).

The construction compound is temporary and will be removed following the completion of construction. The construction compound will be used for storage of construction machinery, materials and wastes as well as the location for site office and welfare facilities. It will also include an area for worker and visitor parking. The construction compound will be placed next to the existing Control Building compound. The construction contractors are expected to use some of offices and welfare facilities in the Control building. The existing waste storage and hazardous materials storage facilities within the secure compound will be upgraded so that they can be used during construction. The use of the existing facilities will reduce the land area required for the temporary facilities. This land is currently in agricultural use and a lease agreement has already been signed with the owner.

The installation of the WTGs will require two, or possibly three, large cranes. The biggest crane is transported to the site by truck and assembled on site. A construction pad (of compacted crushed stone) will be prepared at each WTG location to support the weight of the cranes. These pads will remain in place for the life of the WPP and will be available for use by access cranes should any major repair be required to the turbine. If the terrain permits, the large crane will move under its own power (“crawling”) from one to the construction pad to the next. If the terrain is unsuitable (too soft, wet or steep), then the large crane may need to be disassembled and be moved along the service track and re-assembled at the next WTG location. The WTG components will be placed on the construction pad before being lifted into place. The base of the tower is bolted to the foundations. Each tower section is lifted into place and bolted to the section below. The blades may be bolted to the hub before being lifted to the nacelle or may be fixed once the hub is in place; this varies by turbine manufacturer.

The smaller, crawler cranes will be moved from one WTG location to the next along the site tracks. Existing tracks will be upgraded during the initial site preparation work and will connect the WTGs and the substation compound. The total length of these tracks has not yet been determined and would be subject to final design and micro-siting by the EPC Contractor. The roads will be constructed to a specification similar to the access road, including roadway preparation, stormwater controls, and placing gravel where needed. Roads connecting the compound to the WTGs will be about 4 to 6 m wide, again similar to the access road.

A 33(35)kV underground power transmission line will be placed alongside each of the access tracks. These cables will be armoured with woven metal and buried to a depth of about 1m. Trenches will be approximately 1m wide. Excavated material will be used to backfill the trenches, with stockpiled topsoil and subsoil placed on the surface.

Due to the size of the turbines, it will be necessary to construct substantial foundations. The foundation (head plate) has a truncated cone shape about 25m in diameter at the base. The cone is about 3.2m thick at the centre (which provides the anchor block), and about 1.3m thick at the edge. Each base is supported by 40 reinforced concrete piles. These piles are set out in three concentric circles, with 8 piles in the internal circle and 16 piles both in middle and external circle. The average pile length is 23m and the diameter 1.0m (created by drilling rather than percussion piling). The WTG mounting ring sits on the anchor block and the bottom section of the WTG tower bolts directly to the mounting ring.

About 995m^3 of concrete is required for construction of entire head plate and about 725m^3 for construction of piles, to complete one WTG foundation. The supplier of the concrete has not yet been established but it is likely that C2WE will use it will be off-site.

Steel reinforcement for the structural concrete is expected to be sourced from a local provider but this will be confirmed at a later date.

The WTG maintenance pads, which each cover an area of 2,000 m^2. Each pad will be surfaced with compacted, crushed stone. This stone will be sourced from a commercial supplier near Pančevo.

The supplier of the WTGs has not yet been confirmed but they will be manufactured outside Serbia. It is likely that the WTG components will be brought to Serbia on the Danube River and off loaded at the port of Pančevo. The components will then be transported by road along the State Road 14 from the town of Pančevo to Bavanište and then via small municipal road to the construction site.

For each WTG, a maximum of ten abnormal loads will be required to be transported to site on oversized road transporters from Pančevo Port (20 total trips in and out):

- WTG tower sections - Five loads per WTG (top section, middle 1, middle 2, moddle 3, bottom section), each transported separately.
- Hub – One load per WTG.
- Blades - Three loads per WTG, each transported separately.
- Nacelle - One load per WTG.
- Drivetrain - One load per WTG.

The following photographs were taken during the construction of Čibuk 1 and they are typical of the construction activities that will be used on Čibuk 2. It is worth noting that the Construction Management Plans that were prepared for Čibuk 1 will be updated and amended to take account of the 'lessons learnt' during the construction of Čibuk 1. The mofification of the Construction Environmental ad Social Management Plan is discussed in Section 15.1 of this ESIA report.

The following photographs show the drilling of the holes for the piles, the insertion of the pile former and the completed steelwork for the foundation before the concrete is poured.

Figure 5-14 Forming the WTG Foundation Pile

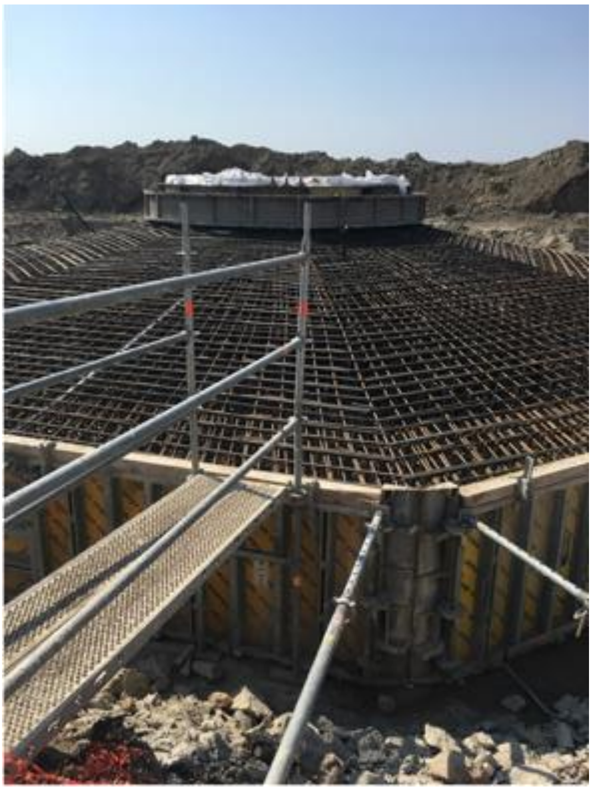

Figure 5-15 WTG Foundation Steelwork

Figure 5-16 Off-loading a tower section from the delivery truck

Figure 5-17 Delivery of a WTG nacelle

Figure 5-18 Erection of the first tower section

Figure 5-19 First tower section installed

Figure 5-20 Second and third tower sections installed

Figure 5-21 Preparing the nacelle and blades to lift

5.7 Operation of Čibuk 2

The operation of the entire Čibuk WPP (C1, C2 and C3) will be managed directly from the on-site Control Building. The Control Building is located within the transformer station compound and it has been designed to meet the long-term operational needs of the WPP. In addition to the Control Room, the building includes administrative offices, workshops, storerooms and welfare facilities. The building also houses low voltage transformers, switchgear (20 KV and 35 KV).

The Control Room itself will be operated by highly experienced staff employed by WEBG (the operators of Čibuk 1). It is likely that these individuals will be supported by a Full Service Agreement ("FSA") Contractor; which will also supply and erect the C2 turbines. The management of the individual WTGs is largely automated and the role of the WPP operators is to ensure the safe and efficient operation of the WPP as a whole.

The Energy Permit for Čibuk 2 will require C2WE to establish and maintain a small team to operate and maintain the WPP. The staffing levels will be described within the Energy Permit when it is finally issued. C2WE will be legally required to comply with this level of staffing. The senior roles likely to be required under the Generating Licence are:

- General Manager;
- Operations Manager;
- Maintenance Manager.

It is likely that day to day management of the Čibuk 2 WPP will be provided by an OM Contractor.

The operation and performance of the WTGs will be managed by a specialist team provided by the FSA. These individuals will be based at the on-site control room within the Control Building. The on-site control room will be staffed from 08:00 to 16:00 from Monday to Friday. The control room team will also operate an out-of-hours standby system to manage breakdowns or emergencies.

The FSA will also provide continuous monitoring of the WTGs (including any fault or failure conditions) from an off-site Control Room. Should any operational issues arise then the O&M Contractor will try to resolve these from the Control Room and send an information email to their local team in Serbia. The operation of the sub-station is likely to be the responsibility of C2WE, while the Interconnection infrastructure is the responsibility of the Serbian statutory transmission Electricity Supply operator, Elektromreža Srbije ("EMS"). The interconnection infrastructure includes a High-Voltage Switchyard and Overhead line 110 kV.

The operational life of the WPP is expected to be 30 years; this is the typical working life of a wind turbine blade.

5.8 Decommissioning or Re-Powering the Čibuk WPP

As the WPP approaches the last few years of operation, C2WE will consider the closure or continued operation of the WPP, i.e., will it be decommissioned or the wind turbines replaced with new units. The decommissioning of a WPP is not a complicated process and largely comprises the dismantling of the turbines, removal of the turbine foundations and site clearance. Steel and other useful materials will be recycled. Inert materials that cannot be re-used or recycled will be taken to a suitable landfill.

The sub-station may continue to be occupied, and the transmission line may continue to be used. Where not required, they will be dismantled, and metals recycled.

As the operation of the WPP does not involve the use of large volumes of hazardous materials it should not be necessary to conduct an extensive post-operational clean-up. The design of hazardous materials storage areas and the secondary containment placed around the transformers should ensure that no polluting materials enter the ground beneath the site. Basic operational control measures will be included in the design to ensure ease of decommissioning. Key difficulties associated with the decommissioning of a WPP are the removal of foundations (if considered necessary) and the disposal of turbine blades, if their design does not facilitate ease of recycling.

Foundations and other below ground inert structures may be buried and covered with soil. These areas and other land that is no longer going to be used will probably be returned to agricultural use.

Decommissioning activities will be conducted under safety conditions and in consideration of environmental protection, under the relevant legislation in force at the time of decommissioning.

It is unlikely that the WTG foundations will be completely removed. Instead, the concrete will be demolished and excavated down to a depth to be determined prior to decommissioning. Nominally a depth of 1m is expected to be sufficient to allow for agricultural activities to be undertaken safely once the trench has been filled with top soil. Similarly, any ground associated with the WPP which has been effected will be reinstated. This includes areas of temporary roads, areas where the land has been compressed by heavy plant activities, and laybys and temporary platforms.

There will be no underground electrical cables laid less than 1m deep as, according to the local regulations and the conditions issued to C2WE, the minimum depth for laying the cables must be 1.2m. All electrical cables laid more than 1 m deep will be abandoned in place and will not cause any long term significant environmental impact.

Should C2WE choose to re-power the Čibuk WPP then it is possible to replace the older units with new, higher capacity turbines or retrofitting them with more efficient components. Re-powering this significantly increases WPP production and extends WPP life; re-powering can add 30 years to the operational life of a WPP.

6 Study Area, Survey Methodologies and Data Modelling

6.1 Project Area of Influence

All projects have direct and indirect impacts on the environmental and social setting where they will be placed. Consideration of these impacts means that the scope of the ESIA goes beyond the physical footprint of the facilities or infrastructure to be built and includes the activities undertaken during the construction, operation and decommissioning of the project. Specifically, the IFC PS1 require a broader consideration of:

1. The area likely to be affected by:
   - Project activities and facilities that are directly owned, operated, or managed (including by contractors) by the Developer;
   - Impacts from unplanned but predictable developments caused by the Project that may occur later or at a different location; or
   - Indirect project impacts on biodiversity or on ecosystem services upon which 'Affected Communities' livelihoods depend.
2. Associated facilities, which are facilities that are not funded as part of the Project and that would not have been expanded if the Project did not exist and without which the Project would not be viable.
3. Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the Project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

The basis of the Area of Influence ("AoI") for the Čibuk 2 ESIA is summarised in the following Table 6-1. This broad definition of the AoI has been applied by the technical specialists involved with the Čibuk 2 ESIA. Any variations to the broad definition are explained in the body of the Chapter.

Table 6-1 General Definition of a Project Area of Influence

Impact Type	Area of Influence by Project Phase	
	Construction	Operation
Air Quality - dust and emissions from project vehicles	100m either side of the transport routes to the site. 100m either side of tracks within the construction site. 500m zone around working areas.	There are no significant sources of emission during operation.
Noise	250m either side of the roads used for the transport of workers and materials to and from the construction site. 250m either side of all construction areas where mobile plant and vehicle may generate noise.	Defined by quantitative modelling as the area impacted by noise from the WTGs. The limits at the noise sensitive receptor (NSR) are based on Serbian and IFC limits.
Ecology, nature conservation and ecosystem services	The area cleared for the construction of the Project as well as access roads, cable installation, construction camp or compound, lay-down areas or similar activities. Areas identified by the ESIA where access will not be allowed during the construction period. These areas may be fenced.	The geographical area where biodiversity or protected species, could be impacted by the windfarm project. This includes the area up to 500 m from each WTG and up to 2 km from the boundary of the windfarm for direct impacts, and wider area (South Banat region) determined by possibility that birds, bats and/ or other species from certain populations/area occur at the WPP site.

Impact Type	Area of Influence by Project Phase	
	Construction	Operation
Visual and Landscape	1km from the working areas to take account of artificial lights and the use of large items of equipment such as cranes.	Radius of 45km of the WPP site. Adjusted and defined by quantitative modelling as the Zone of Theoretical Visibility.
Transport and traffic	All roads which will be used for the transport of turbine components and construction material.	Roads within 5km of the WPP site which will be used for the transport of maintenance equipment.
Cultural heritage and archaeology	Archaeological monuments and other features within 1km of a WTG.	Archaeological monuments and other features within 1km of a WTG.
Community health, safety and wellbeing	100m either side of the transport routes to the site. The geographical area where workers could interact with local residents and potentially spread communicable diseases such as Covid-19.	100m either side of the transport routes to the site. A perimeter with the diameter of 1.5 times the highest point of the WTG (i.e. to the blade tip). This is the area that could be impacted due to a sudden collapse of a WTG, loss of a blade, or a fire within the nacelle. Defined by quantitative modelling of the shadow flicker limit within the ten times rotor diameter area of the candidate turbine model.
Land use	Defined as the land that may be used by the project. Permanent areas include the land acquired under lease agreements for the WTGs and access roads. Temporary areas include the working area, the construction compound and laydown areas,	Defines as the area occupied by the WTG foundations and maintenance pads, as well as site tracks.
Public infrastructure	Specific location where roadways may need to be widened, or the curve radius changed, to allow WTG convoys to pass.	May be required if any WTGs need to be replaced.
Employment and other expectations	The area that includes communities or residents that expect to benefit from the Project. This could be direct employment or through increases in local tax revenue.	The area that includes communities or residents that expect to benefit from the Project. This could be direct employment or through increases in local tax revenue.
Procurement and the generation of energy	The area within which local businesses may be used for the procurement of goods and services.	The area within which local businesses may be used for the procurement of goods and services.

With these requirements in mind, the Project Area of Influence, which forms the basis of the study area, for the preparation of the Čibuk 2 ESIA includes the:

- Any potential impacts on local and migratory bird and bat populations, including stopover sites, and the possible creation of barrier, displacement or cumulative effects, as well as any potential impacts on other biodiversity;
- The transport route to site for heavy vehicles and, in particular, the delivery of the WTG components;
- The impact on the wider landscape as defined by a Zone of Theoretical Visibility;

- The potential for economic displacement and or social disruption as well as any benefits due to the presence of the construction teams within the local communities;
- The benefit to the local communities of tax paid by C2WE or any other community investments or donations;
- Location of the concrete batch plant (if the batch plant is off-site, then the routing of the concrete delivery vehicles will be included in the assessment of transport impacts).

The ESIA will also include consideration of potential cumulative impact of the Čibuk 2 wind power plant. The Cumulative Impact Assessment (see Section 9.4) will include the definition of a temporal and spatial boundary for the CIA.

6.2 ESIA Study Area

6.2.1 Ecology and Nature Conservation

The Survey area for each of the ecological surveys was defined according to the GIIP guidance (as elaborated in section 6.3.3) and is limited to the area extending 500 m beyond the Project infrastructure. It is important to note that the survey area was defined based on the initial Project design that included both Čibuk 2 and Čibuk 3 (Figure 5-5) and this was maintained throughout the survey period to ensure the consistency of data. As the area defined by the outermost WTG locations has been reduced by the split, the survey area fully encompasses the Čibuk 2 project area.

The potential Area of Influence included designated sites as well as the broader geographic area where cumulative impacts can be assessed. It should be noted that the natural (biogeographic) South Banat region (ca. 5,000 km^2) considered relevant here is slightly larger than the administrative South Banat district (4,245 km^2), and encompasses the area between upper and middle Tamiš river valley, Danube River and the state border with Romania. Transboundary effects have been considered for long-distance migratory populations, where applicable.

Control or reference site surveys were <u>not undertaken</u>. Best practice guidance for birds (SNH 2005, 2014b) and SNH 2017), recommend that for proposals greater than 50 MW that a comparable control or reference site should also be selected and surveyed at the time of pre-construction surveys. This is recommended to allow Before-After-Control-Impacts (BACI) comparisons (Anderson *et al.* 1999) to be made during post-construction monitoring. However, as established already for other WPP projects within the South Banat region, a comparable control or reference site is not available as the potential sites are already occupied by, or directly influenced by, other WPPs.

All bird and bat species are legally protected in Serbia. As required by Nature Protection Conditions for the project, all bird and bat populations occurring at the site were considered, including resident, breeding, migrating, and wintering, as well as all aspects of habitat use, particularly: nesting/ roosting, foraging, resting, commuting and migration. Bird species were classified as target or secondary species and treated accordingly. The Čibuk 2 ESIA considered also the potential Project impacts on other ecological features, including habitats, flora, ground mammals, reptiles, amphibians, and invertebrates within the survey area, protected species in particular.

6.2.2 Landscape and Visual Impact

Wind turbines are large structures that inevitably attract a range of opinion, from very adverse to very beneficial. As a consequence, this LVIA has adopted the precautionary principle, and assumes that all landscape and visual impacts that occur as a consequence of the Project are adverse.

In addition, the prominence of the turbines in the landscape will vary according to the prevailing weather conditions. The assessment has been carried out, as is best practice, by assuming the ‘worst case’ conditions, i.e. a clear, bright day in winter, when neither foreground deciduous foliage nor haze can interfere with the clarity of the view obtained.

There is no Serbian guidance for landscape and visual impacts that would provide specific recommendations for the Study Area. UK (NatureScot) guidance recommends that the initial Zone of Theoretical Visibility (ZTV) for turbines with blade tip higher than 150m should be 45km, allowing adjustments based on specific characteristics of the landscape and/or proposed development.

The Study Area for this assessment has been defined by taking into account the uniform and homogenous landscape character of South Banat, predominantly flat terrain and drawing from experience in already developed large scale windfarms in the region. The experience has shown that significant effects on the landscape character and visual receptors have not extended beyond 20km even during conditions of a very good visibility.

Based upon this, the spatial scope (and the ZTV) for the proposed Čibuk 2 WPP has been defined at a distance of 30km radius.

With respect to significant cumulative effects, the large scale and flat landscape of the South Banat area has been taken into account and the assessment has been focused on developments that are likely to give rise to significant cumulative effects due to their proximity and inter-visibility in combination with the Čibuk 2 WPP. Based upon the experience in the South Banat landscape, there is a limited visibility of windfarm developments beyond 20km of a viewpoint location. The extent of the cumulative Study Area has been therefore established as a 30km radius from the outer boundary of the Čibuk 2 WPP site.

6.2.3 Shadow Flicker

There is no official Serbian guidance for shadow flicker impacts that would provide specific recommendations for the Study Area. International best practice considers that shadow flicker from wind turbines does not occur beyond a distance equivalent to ten rotor diameters from a given wind turbine. The distance of ten rotor diameters has been adopted in this assessment.

The preferential wind turbine model selected by the Developer is General Electric GE Cypress 6.1-158, having the rotor diameter of 158m. The Study Area of ten rotor diameters, i.e. 1,600m has been set for the proposed development.

6.2.4 Traffic and Transport

Although all construction materials would be sourced from locations off-site, it is assumed that the project-related traffic would be most pronounced in the vicinity of the site. The further are the vehicles from the site they would disperse over the wider road network and the potential effects on traffic and transportation are less likely to be significant.

International transport of wind turbine components by river barges is not included in this assessment, assuming that there is a sufficient infrastructure before the Serbian waterways to manage the required transport.

The city of Pančevo (c. 25km from the site) is a regional centre and key transportation hub and it is assumed that the majority of construction materials for the project would arrive on a shortest eastbound route from Pančevo via Bavanište to the WPP site. It is not yet been decided if an existing, commercial concrete batching plant will be used for the Project or if a plant will be constructed on or near the construction site.

The likely route to the WPP site that would be used by general construction traffic is the following:

- Road No. 10: Pančevo (Vojvodina border) – Pančevo (Kovin)
- Road No. 14: Pančevo (Kovin) – Kovin (Bela Crkva);

At the time of writing (October 2022) the Developer is considering five options for the route for transport of the large turbine components to the site. The WTG components will be off-loaded from barges docking at the port of Pančevo on the Danube River. The longest transport option is approx. 45km long, the shortest is approx. 20km long. The options are discussed in Section 11.4 Traffic and Transport.

For each WTG, a maximum of 11 abnormal loads will be required to be transported to site on oversized road transporters from Pančevo Port (22 total trips in and out):

- WTG tower sections – Five loads per WTG (top section, middle 1, middle 2, middle 3, bottom section), each transported separately.
- Hub – One load per WTG.
- Blades – Three loads per WTG, each transported separately.
- Nacelle – One load per WTG.
- Drivetrain - One load per WTG.

The Study Area has been defined to include all sections of the public road network which are being considered as transport route options between Pančevo and the development site.

6.3 Baseline Studies and Assessment Methodologies

In order to identify the scale of the potential effects of the Project, it is necessary to establish the baseline conditions at the time of assessment. The baseline condition of the study area was established using:

- Site visits and surveys;
- desk-based studies of existing information;
- modelling; and
- consultation with the relevant stakeholders (as defined by the SEP).

The initial characterisation of the existing physical, ecological and social environment included a desktop study of data provided by the Developer (such as WPP design and land acquisition data) as well as from published sources (such as satellite imagery, aerial photography, topographical maps, statistical data, local development plans, environmental studies and academic papers).

The desktop study was then supplemented by extensive field surveys defined by the technical experts who undertook the impact assessment. Some of the photographs taken during the field surveys have been included in this ESIA report.

The following sections describe the field study methodologies, the modelling applied to the data collected and the assessment methodologies that were used.

6.3.1 Socio-Economic

The social impact element of the ESIA describes how stakeholders (identified within the SEP) have been informed, consulted, and have participated in the process of preparing the ESIA. Stakeholders have assisted in the identification of potential socio-economic impacts and provided information on socio-economic conditions and land use activities.

The social impact assessment considers the changes which may occur during the construction, operation, and decommissioning of the Project in demographics and economics, social infrastructure, land use, community wellbeing, and the health and safety of workers and communities.

The social impact assessment included the following tasks:

- Identifying types of adverse and beneficial impacts of the proposed action.
- Assessing the level of socioeconomic risks in terms of frequency (how likely is it to happen) and consequences.
- Assessing the acceptability of the risks.
- Introducing mitigation measures to reduce risks to acceptable level.

The social impact assessment has considered:

- Demographics: Changes in local population size, emigration/immigration in the area, migration of people in search of work, and other issues.
- Economic issues: Supply chain impacts, local sourcing opportunities, potential impacts on local markets for goods and services, the impact on livelihoods from changes in land lease agreements and restrictions in land access, the impact of an influx of workers, employment opportunities for construction, operation, and decommissioning phases of the Project.
- Health issues: Risks of new diseases to local communities (particularly from an influx of workers during construction), impacts on health of operations personnel and local communities, impacts from road transport (and the potential for damage to occur to local roads), impact of local diseases on workers.
- Social infrastructure: Adequacy of health care and education facilities, transport and roads, power supply, fresh water supply to support project activities and personnel as well as the local communities.
- Resources: Land use changes, increased access to rural or remote areas, use of natural resources.
- Psychological and community aspects: Changes from traditional lifestyles, community cohesion, attitudes and behaviour, perception of risk.
- Cultural: Issues associated with sites that have archaeological, historical, religious, cultural, or aesthetic values.

- Social equity: Local social groups who will gain or lose as a result of the Project or operation.

6.3.2 Ecosystem Services

The UN Millennium Ecosystem Assessment (MA) published in 2005 defined Ecosystem Services as “the benefits people derive from ecosystems”. Besides provisioning services or goods like food, wood and other raw materials, plants, animals, fungi and micro-organisms provide essential regulating services such as pollination of crops, prevention of soil erosion and water purification, and a large range of cultural services, like recreation and a sense of place.

Despite the ecological, cultural and economic importance of these services, ecosystems and the biodiversity that underpins them are still being degraded and lost. One major reason for this is that the value (importance) of ecosystems to human welfare is still underestimated and not fully recognized in every day planning and decision-making, in other words, the benefits of their services are not, or only partly, captured in conventional market economics.

Many of the most significant changes to ecosystems have been essential to meet growing needs for food and water; these changes have helped reduce the proportion of malnourished people and improved human health. Agriculture, including fisheries and forestry, has been the mainstay of strategies for the development of countries for centuries, providing revenues that have enabled investments in industrialization and poverty alleviation.

These gains have been achieved, however, at growing costs in the form of the degradation of many ecosystem services, increased risks of nonlinear changes in ecosystems, the exacerbation of poverty for some people, and growing inequities and disparities across groups of people.

Ecosystem Services have been broadly categorised by the MA in accordance with the following:

1. Supporting:
   - Nutrient cycling;
   - Soil formation;
   - Primary production;
2. Provisioning of Food:
   - Freshwater;
   - Wood and fibre;
   - Fuel;
3. Regulating or Climate Regulation:
   - Flood regulation;
   - Disease regulation;
   - Water purification;
4. Cultural or Aesthetic:
   - Spiritual;
   - Educational;
   - Recreational.

The IFC PS6 requires a systematic review to identify priority ecosystem services and assess potential disruptions to them. The following process proposed by the World Resources Institute has been adopted within this assessment to identify the priority ecosystem services:

1. Could the Project affect the ability of others to benefit from the ecosystem service?
2. Is the ecosystem service important to beneficiary livelihoods, health, safety or culture?
3. Do beneficiaries have viable alternatives to the ecosystem service?

Priority ecosystem services are those for which the answer to question 1 and 2 has been “Yes” or “Unknown” and the answer to question 3 has been “No” or “Unknown”. The ecosystem services categorised as “non-priority” have not been considered further.

There are strong linkages between categories of ecosystem services and components of human well-being that are commonly encountered. Within the project site the function of the land is to accommodate grazing of livestock. No other services have been identified. The irrigation canals are outside the project boundary and no important plant species were encountered. All land has been previously leased to private individuals and has now been leased to the Project Company. As a result, the site is not deemed to provide any ecosystem services.

6.3.3 Ecology and Nature Conservation

6.3.3.1 Permit Conditions

The IfNC included a number of Nature Protection Conditions ("NPCs") in the Zoning Plan as well as in the Location Permit. The Location Permit NPCs are listed in section 3.2. and these relate largely to the construction and operation of the WPP.

The NPCs for the Zoning Plan that relate only to the pre-construction ecological surveys and are:

Condition 7: The developer is obliged . . . to prepare a study of impacts of proposed WPP on birds and bats. The surveys for the study have to be undertaken for a minimum of one year. The study must present data on:

a) all bird and bat species occurring at the site and in the surroundings during the survey period of one year at least,
b) international and national conservation and protection status of all species,
c) populations of all species,
d) seasonal changes in population numbers during the survey period,
e) commuting and migration routes,
f) breeding sites,
g) staging sites,
h) wintering sites,
i) possible significant impacts of the WTGs on birds and bats,
j) overview of measures to avoid, mitigate and offset all significant adverse impacts of the WTGs on birds and bats."

6.3.3.2 Available Background Information

Čibuk 1 ESIA was undertaken in undertaken in 2011 and was then subsequently updated in 2014. The 2014 ESIA was approved by the Lenders. A programme of bird and bat surveys was undertaken within the scope of the EIA/ ESIA between 2009 and 2012, which is summarised in the ESIA (Atkins 2014). All the details are available in the original survey reports (Rašajski 2011, Paunović & Karapandža 2011a, 2011b, Karapandža & Paunović 2011, 2012, Watts 2012). A programme of additional pre-operational bird and bat surveys was undertaken in 2018 and the impacts of the Čibuk 1 WPP on birds and bats re-assessed.

The post construction (operational) monitoring programme at the Čibuk 1 WPP has been in place since July 2020. Monitoring includes bird and bat activity and mortality surveys, and all the data up to date have been summarised in the annual report (Karapandža et al. 2022). Data, analyses and conclusions from all these surveys are considered a unique, comprehensive and invaluable resource, and this Assessment has built upon these. Furthermore, the methodological design of the previous surveys/assessments been maintained as much as possible, to maximise comparability of the results.

6.3.3.3 Classification and Nomenclature

The following classifications have been used in this ESIA:

- The EUNIS Habitat classification system (EEA 2017) was adopted for the Čibuk 2 ESIA. This system is a comprehensive Pan-European system for habitat identification devised by the EU European Environment Agency. The classification is hierarchical and covers all types of habitats from natural to artificial, from terrestrial to freshwater and marine. The habitat types are identified by specific codes, names and descriptions (EEA 2020). Although Serbia is still an EU candidate country, this system of habitat classification describes many of the habitats of neighbouring countries, including Croatia, Hungary, Romania and Bulgaria. As such, it was considered that the habitat categories within the EUNIS system would be suitable to describe the habitats likely to be encountered within the site. For convenience, along with EUNIS codes and names, corresponding habitat types according to EU Habitats Directive Annex I (Official Journal of the EU [1992/43/EEC]) and national (Official Journal of RS, No. 35/2010) classification systems are also given, as applicable.

- The latest World Plants checklist (Hassler 2019) was followed regarding plant species and using English nomenclature, in congruence with a checklist of the flora of Serbia (Niketić & Tomović 2018) and regional flora (Josifović 1970–1977, Sarić 1992, Stevanović 2012) and in consultation with other relevant sources (WCSP 2021, WPPO 2021) regarding scientific nomenclature and classification.
- The latest IOC World Bird List (Gill et al. eds. 2021) was followed regarding bird nomenclature (scientific and English) and classification.
- Current IUCN (2022) Red List was considered referential regarding bat scientific nomenclature and classification, and EUROBATS (Lina 2017) regarding English nomenclature
- Current IUCN (2022) Red List was followed regarding classification and nomenclature of fauna species other than birds, bats (see above) and butterflies, where current European checklist was followed (Wiemers 2018).
- Information pertaining to protected areas was sourced from the Bird Life Data Zone with regards to Important Bird Areas (IBAs) as well as through consultation with local experts regarding locally or nationally protected areas in the vicinity of the wind farm.

6.3.3.4 Bird Target and Secondary Species

NatureScot guidance requires that bird species of particular concern or target species are “likely to be affected by wind farms” and must be “afforded a higher level of legislative protection”. Target species should be identified during the scoping phase, although additional species can be added at a later stage during the site surveys.

For the purpose of this assessment, the NS criteria were further specified, as follows:

1. Species fulfilling one of the following sub-criteria were regarded as being “afforded a higher level of legislative protection”:
   - Listed on the CMS Appendix I or II (Official Journal of RS, No. 102/2007b);
   - Listed on The Bern Convention Appendix II (Official Journal of RS, No.102/2007a);
   - Listed on the EU Birds Directive Annex I (Official Journal of EU [1992/43/EEC]);
   - Strictly Protected in Serbia (Official Journal of RS, No. 5/2010, 32/2016, 98/2016);
   - Classified as Threatened i.e. Critically Endangered (CR), –Endangered (EN), –Vulnerable (VU or at least Near Threatened (NT), at global or regional [European] level on the current version of the IUCN (2022) Red List of Threatened Species, or national level according to the Red Book of birds of Serbia (Radišić et al. eds. 2018);
   - Considered to be of conservation concern by BirdLife International (2017), either as SPEC 1 (European species of global conservation concern), SPEC 2 (species of European conservation concern whose global population is concentrated in Europe), or SPEC 3 (species of European conservation concern whose global population is not concentrated in Europe).
2. “Species considered likely to be affected by wind farms” (Langston & Pullan 2003, Gove et al. 2013, SNH 2017, 2018a, European Commission 2010) potentially occurring at the site include: waterfowl (Anatidae), cranes (Gruidae), storks (Ciconiidae), herons (Ardeidae), cormorants (Phalacrocoracidae), owls (Strigiformes), raptors (Accipitriformes and Falconiformes), and certain near passerines (Coraciiformes).

The preliminary target species list based on previous surveys at the Čibuk 1 site and SS desk studies comprised 37 species, of which only 9 species were recorded by these ESIA surveys at the Čibuk 2 site and no additional species meeting the criteria. Based on the criteria above, a final list of 9 target species was defined (see Appendix C).

Since all wild bird species are legally protected in Serbia and potentially affected by the Project at least to some extent, and since NPCs require for all bird species to be included in the assessment (IfNC 2021), all species not regarded as target species were considered secondary species.

6.3.3.5 General Methodological Concepts

The ecological methodologies used as the basis of this assessment were devised and conducted in accordance with Serbian legislation and regulatory requirements, IFIs requirements, relevant international best practice and current scientific knowledge. In the absence of applicable national guidance, the methodological concept was based upon international best practice guidelines for Ecological Impact Assessment (CIEEM 2016), with some necessary adaptation to the Serbian situation.

6.3.3.5.1 Baseline Conditions

Baseline ecological conditions were assessed for the WPP site and immediate surroundings as of 2021-2022, based on ESIA surveys, whilst for the AoI based on the latest data available.

All geospatial data (surface areas, lengths, distances) presented and used are original measurements taken in Google Earth Pro software (© Google LLC).

6.3.3.5.2 Consideration of Significance

In broad terms, significant effects encompass impacts on the structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution). Significant effects should be qualified with reference to an appropriate geographic scale (e.g. local, regional, country). Use of the mitigation hierarchy to avoid, minimise, restore and offset impacts should also be consistent across geographic scales.

Significant effects encompass impacts on the structure and function of defined sites and ecosystems. The following need to be determined:

- For designated sites designated sites – is the Project and its associated activities likely to undermine the conservation objectives of the site, positively or negatively affect the conservation status of the qualifying features (species or habitats) for which the site is designated.
- For ecosystems – is the Project likely to result in a change in ecosystem structure and function?

Consideration should be given to whether:

- Any processes or key characteristics will be removed or changed.
- There will be an effect on the nature, extent, structure and function of component habitats.
- There is an effect on the average population size and viability of component species.

Consideration of functions and processes acting outside the formal boundary of a designated site is required, particularly where a site falls within a wider ecosystem e.g. groundwater dependent terrestrial ecosystems can be damaged where the proposed activity impacts on the quantity or quality of groundwater that feeds these habitats. Predictions should always consider wider ecosystem processes.

Consideration of conservation status is important for evaluating the effects of impacts on individual habitats and species and assessing their significance:

- Habitats – conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area.
- Species – conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area.

In many cases (e.g. for species and habitats of principal importance for biodiversity), there may be an existing statement of the conservation status of a feature and objectives and targets against which the effect can be judged. The conservation status of a habitat or species will vary depending on the geographical frame of reference. When assessing potential effects on conservation status, the known or likely background trends and variations in status should be taken into account. The level of ecological resilience or likely level of ecological conditions that would allow the population of a species or area of habitat to continue to exist at a given level or continue to increase along an existing trend or reduce a decreasing trend, should also be estimated.

National and regional Red List data books as well as other available sources (e.g. IUCN, Habitats Directive Annexes) were used to inform the impact assessment when characterising species sensitivity.

The evaluation of significant effects should always be based on the best available scientific evidence. If sufficient information is not available further survey or additional research may be required. In cases of reasonable doubt this must be acknowledged in the assessment and the precautionary principle should be applied.

6.3.3.5.3 Nature Conservation Evaluation

Only those ecological features (species, habitats and sites) considered to be potentially affected by the project and of significant nature conservation value (i.e., "important") should be the subject to detailed impact assessment (Official Journal of RS, No. 135/2004, 36/2009b, 69/2005b, CIEEM 2016, SNH 2018a, European Commission 2020). Nature conservation evaluation has been undertaken in two steps:

1. Evaluation of conservation concern of habitats and species occurring at the WPP site and potentially affected sites/ habitats, and
2. Assessment of nature conservation value of habitats and species of conservation concern occurring at the WPP site.

Rating of the nature conservation value was assessed using the following grades:

- Major,
- Moderate,
- Minor,
- Negligible,
- None.

The geographical scale was defined according using following levels:

- Global,
- European,
- National = Serbia,
- Regional = South Banat region,
- Local = municipal.

Nature conservation value of any ecological feature was always assessed at the highest relevant geographical level. Ecological features valued (rated minor or higher) at regional level or higher are considered as of significant nature conservation value (CIEEM 2016, SNH 2018a).

Each potential impact on each ecological feature (habitat, species and site) identified as of significant nature conservation value was systematically assessed, as required (CIEEM 2016, SNH 2018a, Rodrigues et al. 2015, Hundt ed. 2012, Collins ed. 2016, European Commission 2020, Bennun et al. 2021).

Impacts were described using their following characteristics and ratings, according to relevant guidance:

- Magnitude: major, moderate, minor, negligible, no;
- Direction: positive or negative;
- Extent (geographical scale): global, European, national (Serbia), regional [South Banat], local (municipal);
- Duration, timing and frequency: short, medium or long-term, temporary or permanent;
- Reversibility: reversible or irreversible.

The magnitude of the impacts was quantified whenever possible (i.e. amount of the habitat lost, percentage of the population affected or lost).

Impacts on habitats were assessed based on habitats locations within the WPP site in relation to planned locations of the WPP infrastructure.

Assessment of impact on populations was undertaken in three steps:

1. Estimation of site-and-population-specific risk of particular impact, on the basis of occurring population ecological status at the site (established within the scope of this assessment), and species-specific susceptibility to the impact (determined by species ecology);
2. Estimation of the potentially affected population sensitivity, on the basis of population nature conservation value (established within the scope of this assessment), and, where possible, relevant population size and demographic parameters;
3. Estimation of the impact effect on the sustainability of potentially affected population, on the basis of estimated site-and-population-specific risk, and population sensitivity.

Justification for the assessment of each impact on each potentially affected ecological feature has been clearly presented.

According to relevant guidance (CIEEM 2016, SNH 2018a, Hundt ed. 2012, Collins ed. 2016, Rodrigues et al. 2015, European Commission 2020), significant impact is an impact likely to affect the conservation status of an ecological feature (population or habitat). Following principles set out in relevant guidance and adapting them to Serbian context and relevant geographical scope, impacts assessed as minor or higher at regional level (at IBA level for triggering populations which may be affected the Project) or higher, were considered as significant impacts for the purpose of this assessment. A precautionary approach was followed, as required by all relevant documents, i.e. in cases where it was not possible to robustly justify a conclusion of no significant effect, a significant effect has been assumed.

Neither scoring nor matrix approach has been used to determine the significance of impacts, since considered spurious and thus their use discouraged (CIEEM 2016).

The evaluation of the impacts has been undertaken at three stages of the assessment:

1. Evaluation of impacts without any mitigation implemented;
2. Evaluation of residual impacts (after mitigation);
3. Evaluation of cumulative impacts.

6.3.3.5.4 Mitigation

Mitigation was devised and proposed following legal requirements, NPC (IfNCV 2021, 2022) and relevant best practice guidance (CIEEM 2016, 2018a, Rodrigues et al. 2015, Hundt ed. 2012, Collins ed. 2016, European Commission 2020). As required (IFC 2012a, EBRD 2019, CIEEM 2016, European Commission 2020), the **mitigation hierarchy** – a strategy to reduce impacts based on avoidance of impact first, then minimisation (or mitigation), and finally compensation (i.e. restoration and offsetting) of residual effects, in that order, was adopted and implemented.

6.3.3.6 Desk Study

The ESIA desk study was undertaken between December 2020 and October 2022. It considered all relevant publicly available sources (printed and online), as well as previous survey and monitoring data at the Čibuk 1 site, ESIA team own data (from occasional observations and surveys unrelated to this assignment) and feedback from walkover surveys.

In addition, the following websites were used to search for relevant information and publications:

- https://www.iucnredlist.org/
- http://datazone.birdlife.org/home
- http://www.keybiodiversityareas.org/kba-data
- http://iwc.wetlands.org/
- http://wow.wetlands.org/en
- https://cloud.gdi.net/visios/zzps
- http://www.pzzp.rs/rs/sr/zastita-prirode/ekoloska-mreza.html
- http://pticesrbije.rs/
- https://scholar.google.com/
- https://www.researchgate.net
- https://biologer.org
- https://www.gbif.org/
- https://www.inaturalist.org/
- https://euro.observation.org/
- https://ebird.org/explore
- http://www.rarebirds.hu/map.php
- https://www.mammalwatching.com/

Only data on species occurrence from the last ten years, i.e. from 2011 to date, were considered relevant for the purpose of the C2 assessment.

In instances where sources do not present species occurrence data for exact locations but per MGRS 10x10 km squares, the DQ96 square that encompasses survey area was considered relevant.

6.3.3.7 Field Surveys

An overview of the implemented survey methodologies is provided in this section, whilst more details on survey and assessment methodology specifics for particular ecological features are provided in following sections. All the details on bird and bat survey methodologies are provided in Appendix C.

A programme of pre-construction habitats, flora and fauna surveys, bird and bat in particular, has been undertaken between December 2020 and February 2022 within the scope of this ESIA (Table 6-2).

The SS concluded that the Čibuk 2 WPP had the potential to create a major impact on populations of birds and bats and thus Detailed Assessment and full-scope bird and bat surveys have been undertaken accordingly within the scope of this ESIA. The SS has also concluded that the potential impacts on habitats and protected species other than birds and bats were not likely to be significant, and only limited surveys have been undertaken for most ecological features.

Table 6-2 Timetable of Realised Preconstruction Biodiversity Surveys

(December 2020 – February 2022)
Showing the number of man-days per month and survey

	Survey \ Year	2020	2021											2022		Total
	Month	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	
	Site reconnaissance and preliminary appraisal	2	1		1												4
	Habitat mapping and flora surveys*						2										2
	Fauna walkover surveys						1	2		1							4
Bird surveys	Breeding farmland bird surveys					2	2	2									6
Bird surveys	Breeding raptor surveys					2	2	2	2								8
Bird surveys	Breeding owl surveys					1	1	1	1								4
Bird surveys	Wintering bird surveys													2	2	3	7
Bird surveys	Vantage point surveys				4	4	4	4	4	4	4	4	4	4	4	4	48
Bat surveys	Roost surveys		1	1			1	2	2	1	3	2	1				14
Bat surveys	Transect surveys					4	4	6	4	4	6	6	2				36
Bat surveys	Automated surveys					4	4	6	4	4	6	6	2				36

All ESIA field surveys have been carried out by Fauna C&M ESIA Team (assisted by specialised technicians when needed).

6.3.3.8 Designated Sites

For the purpose of this assessment, designated sites include formally Protected Areas and Areas of the Ecological Network of Serbia, as well as generically protected (semi)preserved habitats within the agroecosystems.

There are neither Protected Areas nor Areas of the Ecological Network of Serbia within the WPP site boundary or in the area potentially directly affected by the Project, and no surveys were undertaken for these sites specifically. There are only small elements of generically protected (semi)preserved habitats within the WPP site, which were surveyed within the scope of the ESIA Surveys.

The ESIA identified a number of Protected Areas and Areas of the Ecological Network within the possible AoI. The boundaries of the IBAs are given according to BirdLife International (2022a, b, c, d, e, f, g, h, i, j), and of the Protected Areas and areas of the Ecological Network according to IfNC (2022). Description of designated sites was based on latest relevant information available acquired through desk study (referenced in the text where applicable).

It is noted that only designated sites whose populations are suspected to occur at the WPP site have been considered relevant. Although the geographical context is species-specific, the widest possible context was identified as being of interest.

Sites of conservation concern are statutory sites designated (and proposed) or classified under:

- International conventions or EU legislation, for example:
  - Wetlands of International Importance (Ramsar sites), Key Biodiversity Areas ("KBAs"), IBAs, Critical Sites for waterbird species (AEWA), habitats of regularly occurring globally significant concentrations of migratory bird species (CMS),
  - Areas of the Ecological Network of Serbia (Official Journal of RS, No. 102/2010, IfNC 2022) due to become SPAs (≈IBAs) and SACs (i.e. Natura 2000 sites),
  - Ecological Corridors of International Importance (Official Journal of RS, No. 102/2010, IfNC 2022);
- National legislation, for example:
  - Special Nature Reserves ("SNR") (IfNC 2022),
  - Landscapes of Outstanding Features ("LOF") (IfNC 2022),
  - Nature Parks ("PP") (IfNC 2022),
  - Ecological Corridors of National Importance (Official Journal of RS, No. 102/2010, IfNC 2022);
- Locally designated, for example:
  - Habitats of Strictly Protected Species (IfNC 2020),
  - Ecological Corridors of Regional and Local Importance (IfNC 2020).

The nature conservation value of the designated sites at the WPP site and within the AoI was assessed based on their rated relevance for conservation of flora and fauna, in particular birds and/or bats, and the level of their statutory designation, as follows:

- Global: Wetlands of International Importance (Ramsar sites), Global KBAs, Critical Sites for Waterbirds (AEWA), habitats of regularly occurring globally significant concentrations of migratory bird species (CMS);
- European: Regional [European] KBAs, IBAs, Areas of the Ecological Network of Serbia due to become SPAs (≈IBAs) and SACs (i.e., prospective Natura 2000 sites), Ecological Corridors of International Importance;
- National: Protected Areas of category I (of national or exceptional importance) that do not meet the criteria for higher levels, and Ecological Corridors of National Importance;
- Regional: Protected Areas of category II (of provincial/regional or high importance), and Ecological Corridors of Regional Importance;
- Local: Protected Areas of category III (of local importance), Locally designated Habitats of Strictly Protected Species, Ecological Corridors of Local Importance, and generically protected or (semi) preserved habitats within the agro-ecosystems.

PS6 describes measures a project should follow if it is located within a protected area or internationally recognised area, specifically:

- Demonstrating that the proposed development in such areas is legally permitted;
- Following any protected area management plan;
- Consultation with relevant managers, Affected Communities, Indigenous People and other stakeholders; and

- Implementation of additional activities to promote and enhance the conservation aims and effective management of the area.

6.3.3.9 Habitats

6.3.3.9.1 Survey Methodology

Walkover surveys to observe and map habitats were undertaken in late May 2022. Habitat types were identified and digitally mapped on the spot using GPS and *Google Earth Pro* software (© *Google LLC*). A Detailed Habitat Map of the entire survey area was produced. Habitats were identified, mapped and characterised and their abundance quantified according to surface area, both in hectares and as a % of the survey area.

Habitats fulfilling any of the following criteria were regarded as habitats of conservation concern:

- Priority habitats in danger of disappearance listed as (*) on the EU Habitats Directive Annex I (Official Journal of EU [1992/43/EEC]);
- Classified as Threatened (i.e., CR - Critically Endangered, EN - Endangered, or VU - Vulnerable) on the current version of the European Red List of Habitats (Janssen et al. 2016);
- Conservation Priority Habitat Types listed on the Annex II of the Serbian Code of Regulations on habitats (Official Journal of RS, No. 35/2010).

The nature conservation value of habitats at the WPP site as such was assessed based on their nature conservation concern and ecological context. The nature conservation value of habitats at the WPP site for flora and fauna, birds and bats in particular, was assessed based on their (species-specific) flora and/or fauna interest (i.e. their use by particular species) and the relevant population's nature conservation value (at relevant geographical scale).

All potential impacts of the Project on sites and habitats were considered, as follows (European Commission 2020, Bennun et al. 2021):

- Destruction of habitats – direct complete loss to the construction of WPP infrastructure;
- Degradation of habitats – deterioration of structure and/ or functionality due to the construction works.

6.3.3.10 Flora and Fauna

6.3.3.10.1 Survey Methodologies

Plant species were recorded along with the Habitat Mapping surveys in late May 2022 throughout the WPP site. When definite species identification was not possible on the spot, sample specimens have been collected and identified later on. Collected specimens were identified using Flora Europaea (Tutin et al. 1964, 1968–1980, 1993), regional flora (Josifović 1970–1977, Sarić 1992, Stevanović 2012), and other relevant sources. Based on all records, a consolidated list of plant species within the survey area was produced.

Walkover surveys to record fauna species (other than birds and bats) were undertaken between May and August 2022 throughout the survey area defined by the WPP site boundary. Non-standardised walking and driven transects were used. The occurrence of mammals (excluding bats), reptiles, amphibians, and invertebrates was recorded based on direct visual observations (including individuals and signs such as tracks, laird and feeding evidence) and acoustic observations. Habitat suitability for all subject fauna species was evaluated, and the possibility of additional species occurrence assessed.

Based on desktop and survey data, as well as on evaluated habitat suitability and the possibility of additional species occurrence, consolidated lists of mammals (excluding bats), reptile, amphibian, and invertebrate species were produced.

Rapid biodiversity surveys, as undertaken for flora and fauna species excluding birds and bats within the scope of this ESIA, are limited by factors that affect the seasonal presence of plants and animals and that aid in identification – such as the time of year, phenophases, migration patterns and behaviour. Thus, though many species were identified and recorded, these surveys could not produce a complete list of plant and animal species occurring at the site. To compensate for this limitation, expert judgment was made on the possible occurrence of additional fauna species, based on habitat suitability and species distribution. Such compensation was not considered needed for plant species, since no species of conservation concern are expected to occur at the site based on present habitats and ecological conditions. Since the potential impacts on flora and fauna species other than birds and bats were unlikely to be significant, such approach was considered appropriate.

6.3.3.10.2 Assessment and Evaluation

Fauna (other than birds and bats) and flora species ecological status within the WPP site and immediate surroundings were categorised as follows:

1. Occurrence:
   - X – confirmed,
   - P – probable,
   - ? – possible;
2. Abundance:
   - a – abundant,
   - c – common,
   - u – uncommon,
   - r – rare;
3. Faunistic status:
   - r – resident,
   - v – visitant.

Following flora species were considered as of conservation concern:

- Listed on The Bern Convention Appendix I (Official Journal of RS, No. 102/2007a);
- Listed on the EU Habitats Directive Annex II or IV (Official Journal of EU [1992/43/EEC]);
- Strictly Protected in Serbia (Official Journal of RS, No. 5/2010, 32/2016, 98/2016);
- Classified as Threatened (i.e. CR - Critically Endangered, EN - Endangered, or VU - Vulnerable) globally or regionally [in Europe] on the current version of the IUCN (2022) Red List of Threatened Species, or on the national Red Book (Stevanović ed. 1999).

Following fauna species were considered as of conservation concern:

- Listed on The Bern Convention Appendix II (Official Journal of RS, No. 102/2007a);
- Listed on the CMS Appendix I or II (Official Journal of RS, No.102/2007b);
- Listed on the EU Habitats Directive Annex II or IV (Official Journal of EU [1992/43/EEC]);
- Strictly Protected in Serbia (Official Journal of RS, No. 5/2010, 32/2016, 98/2016);
- Classified as Threatened (i.e., CR - Critically Endangered, EN - Endangered, or VU - Vulnerable) globally or regionally [in Europe] on the current version of the IUCN (2022) Red List of Threatened Species, or on relevant national Red Books or Lists where appropriate (Savić et al. 1995, Kalezić et al. 2015, Tomović et al. 2015, Maes et al. 2019);

The nature conservation value of flora and fauna species populations occurring at the WPP site was assessed based on their ecological status at the site and available population parameters (at relevant geographical scale), using matrix presented in Table 6 3, and then pondered according to species/population conservation status at the relevant scale (see section 6.3.3.11.2.5).

For species / taxonomic groups where population parameters are not available, expert judgment was used to assess the share of the relevant population that occurs at the site and Table 6 3 as a general guidance.

All potential impacts of the Project on flora species were considered, as follows (European Commission 2020, Bennun et al. 2021):

- Loss of habitat – direct destruction/degradation of habitat to or due to the construction of WPP infrastructure;
- Destruction of individuals/populations caused by construction works;
- Illegal deliberate destruction of individuals/populations – construction/maintenance staff could engage in illegal activities of deliberate destruction of protected plants (including medicinal herbs, decorative

plants, wild fruits and berries) and mushrooms, such as picking, collecting, cutting, digging, uprooting etc.

All potential impacts of the Project on fauna species excluding birds and bats were considered, as follows (European Commission 2020, Bennun et al. 2021):

- Loss of habitat – direct destruction/ degradation of habitat to or due to construction of WPP infrastructure.
- Displacement (i.e. disturbance or indirect habitat loss) – if animals avoid WPP and its surroundings due to construction and operation (which may also include barrier effects).
- Accidental/ incidental mortality – death or injury of animals, and damage or destruction of their development stages (including nests, eggs and litters), lairs and habitations, unintentionally caused by construction/maintenance works.
- Illegal deliberate mortality – construction/ maintenance staff could engage in illegal activities of deliberate capture or killing (e.g., poaching), and disturbance of protected animal species, as well as damaging or destruction of their development stages (including nests, eggs and litters), lairs and habitations.

All of the potential impacts on flora and fauna are negative, except possibly for the habitat changes that may have ambiguous effects depending on species (European Commission 2020, Bennun et al. 2021).

6.3.3.10.2.1 Nature Conservation Evaluation - Assessment of Nature Conservation Value

The nature conservation value of populations occurring at the WPP site was assessed based on their ecological status at the site and available population parameters (at relevant geographical scale), using matrix presented in Table 6-3, and then pondered according to species/population conservation status at the relevant scale.

Table 6-3 Assessment Matrix - Nature Conservation Value of Flora and Fauna Species Populations

Percentage of the relevant population that occurs at the WPP site	Occurrence			
	Regular	Occasional	Rare	Incidental
>50%	major	major	moderate	moderate
10-50%	major	moderate	moderate	minor
5-10%	moderate	moderate	minor	negligible
1-5%	minor	minor	negligible	negligible
<1%	negligible	negligible	negligible	negligible

The final conservation value was determined by adjusting the basic rating according to species conservation status (IUCN Red List Category) at relevant geographical scale, as follows:

- for Threatened species (i.e., CR - Critically Endangered, EN - Endangered, or VU - Vulnerable) and decreasing populations – upgrading by 2 levels within the corresponding column of Table 6-3;
- for Near Threatened (NT) and, following precautionary approach, Data Deficient (DD) species – upgrading by 1 level within the corresponding column of Table 6-3;
- for Least Concern (LC) species – taken as it is.

6.3.3.11 Birds

6.3.3.11.1 Survey Methodologies

Bird surveys within the scope of this ESIA were designed and undertaken in full compliance with the most relevant and up-to-date NatureScot (SNH 2017) guidelines, and included as follows:

- Breeding raptor (and other larger bird species) surveys,

- Breeding nocturnal species (owl) surveys,
- Breeding farmland bird surveys,
- Wintering bird surveys (waterfowl in particular),
- Vantage point (VP) surveys;

6.3.3.11.2 Breeding Raptor and Breeding Nocturnal Species Surveys

The aim of Breeding Raptor Surveys and the Breeding Nocturnal Species Surveys was to identify breeding territories and active nests and to assess breeding populations of bird of prey (and other larger) species at the site and in its surroundings. Methodology from Hardey et al. (2009) considered referential by relevant guidance (SNH 2017) was consistently implemented in these surveys.

The survey area extended 2 km beyond the site boundary for all the species that SS and preliminary surveys identified as being potentially impacted (non-negligible).

Total counts of occupied home ranges and active nests were undertaken across the survey area, using walkover surveys (non-standardised driven and walking transects) and territory mapping. Surveyors walked or slowly drove the survey area completely and evenly, locating and mapping all occupied home ranges and active nests of bird of prey (and other larger) species, including owls. Occupied sites or home ranges were identified based on direct observation of nests and nesting and but other indicative signs. Breeding Raptor Surveys were undertaken during the daylight, whilst Breeding Nocturnal Species Surveys were undertaken between dusk and dawn (an hour before sunset and until the sunrise).

Four survey visits were undertaken in April, May, June and July 2021. Each visit for the Raptor Surveys consisted of two survey days needed to cover the whole survey area, whilst one survey day per survey visit was sufficient for Nocturnal Species Surveys.

6.3.3.11.3 Breeding Farmland Bird Surveys

The aims of the Breeding Farmland Bird Surveys were to determine the number of bird nests and/ or breeding territories and to assess breeding bird populations of the common bird species within the study area. Breeding Bird Survey methodology from Gilbert *et al.* (1998) was followed.

The survey area (outlined blue on Figure 6-1) extends 500 m beyond the outermost WTGs (and other Project infrastructure do be developed). A sample of 6 squares, each 1 km^2, was defined (blue squares on Figure 6-1) to provide thorough coverage and representation of the area, both spatially and ecologically. The sampled area equates to about 16.8% of the total survey area.

Each sampling square was surveyed by transect walks along defined routes (yellow lines on Figure 6-1) – sections of pre-existing agricultural rough tracks, some of which will be improved within the scope of the Project (white lines on Figure 6-1. Breeding was identified based on direct observation of nests and nesting and other indicative behaviour such as singing and carrying of nesting material, food and faecal sacs.

Three survey visits were undertaken during April, May and June 2022. Each survey visit consisted of 2 consecutive survey days needed for a single surveyor to cover all 6 sampling squares.

6.3.3.11.4 Wintering Bird Surveys

The aim of Wintering Bird Surveys was to assess the impact on any wintering populations of birds (waterfowl species in particular) using the site and its immediate surroundings as a feeding area. NatureScot methodology for Feeding Distribution Surveys (SNH 2017) was consistently implemented in these surveys.

The survey area extended 500 m beyond the site boundary, as required (SNH 2017).

Total counts of feeding wintering birds were undertaken across the survey area, using walkover surveys (non-standardised driven and walking transects) along the farmland track network. Surveyors walked or slowly drove the survey area completely and evenly and located and counted all feeding birds present. Precise locations (including mapping), numbers of feeding waterfowl species and a number of individuals of all other species were recorded per survey unit.

Fortnightly survey visits were undertaken, as required, throughout the wintering season 2021/2022 (mid-December – February) with seven survey visits undertaken in total. Each visit consisted of one survey day needed to cover the whole survey area.

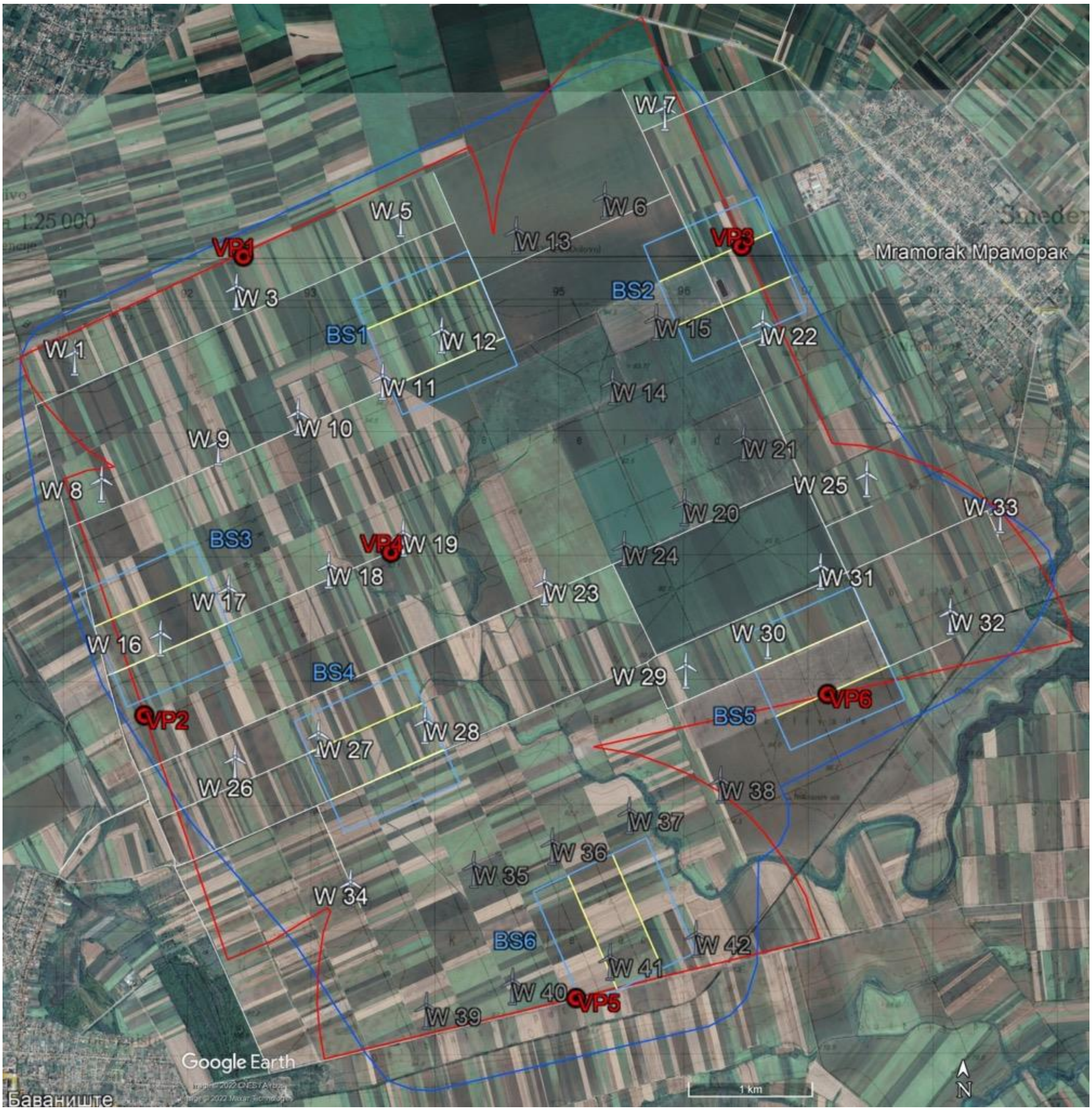

Figure 6-1 Spatial Setup of Bird Surveys

Source: Google Earth 2022, NES, with modification by B. Karapandža and M. Raković, original

Legend and notes: Locations of breeding bird survey sampling squares (light blue) within pertaining survey area (outlined blue); locations of VPs (red spots) and pertaining survey area defined by the total visual envelope (outlined red); locations of WTGs of Čibuk 2 (W white) and Čibuk 3 (W grey), and Čibuk 2 site access tracks (white lines) are also shown.

6.3.3.11.5 Vantage Point Surveys

NatureScot methodology for VP Surveys (SNH 2017) was consistently implemented in these surveys.

Six VPs were defined (red dots on Figure 6-1) to achieve complete visual coverage of the WPP with a minimum number of VPs. Wherever possible VPs were located at the outer edge of the WPP (in order to minimise the surveyor's effect on bird behaviour), but also close to existing rough tracks (to ensure accessibility throughout the season and in a variety of weather conditions). Viewsheds from each of the VPs was defined by 180° arc and 2 km radius. The total combined visual envelope of all VPs (outlined red in Figure 6-1) has an area of about 37.2 km^2 and constitutes the survey area of these VP surveys. The survey area defined in this way largely meets the required areas, which should extend 500 m beyond the outermost WTGs.

Two types of data were recorded: detailed characteristics of all observations/ flights of target species (including mapping of flight trajectories), and a number of individuals of all other (non-target) species recorded per survey unit at certain VP.

VP surveys were undertaken from March 2021 to February 2022. Each survey visit consisted of a single surveyor covering all VP successively during two consecutive days with each observation at each VP lasting 3 hours. Two survey visits were undertaken each month, totalling 6 survey hours per VP each month. Thus, a total of 72 survey hours per VP was conducted, and divided between seasons (36 hours breeding and 36 hours non-breeding).

6.3.3.11.6 Limitations to Surveys

NatureScott guidance recommends that *"[T]wo years [bird] survey . . . [is] required unless it can be demonstrated . . . that a shorter period of the survey is sufficient*", such as "*a lowland farmland site with lower bird interest"* (SNH 2017). The Čibuk 2 WPP site clearly meets the criteria for such a site, as confirmed by previous Čibuk 1 surveys (Atkins 2014, Karapandža & Paunović 2018, 2019) and SS, and thus one full year of bird surveys was considered appropriate.

Although recommended for WPP projects greater than 50 MW where post-construction monitoring will be undertaken (SNH 2017), control/ reference site bird surveys were not undertaken since they were *considered unfeasible* (as elaborated in section 6.2.1).

6.3.3.11.7 Evaluation and Assessment Methodology

6.3.3.11.7.1 Evaluation of Baseline Conditions - Populations

Breeding and wintering bird populations at the WPP site were assessed based on the results from the above surveys.

Local (municipal) population estimates, since not being available, were based on expert judgment.

Regional (South Banat) breeding population estimates were taken from various sources (referenced in the text where applicable), or, if not available, estimated based on population estimates for the wider region of Vojvodina from Puzović et al. (2015), current knowledge and expertise.

Population estimates for Important Bird Areas (IBAs), breeding and/ or wintering whichever relevant, were taken from official IBA / BirdLife web pages: Danube loess bluffs (BirdLife International 2022a), Deliblatska peščara (BirdLife International 2022b), Gornje Potamišje (BirdLife International 2022c), Južni Banat (BirdLife International 2022d), Labudovo Okno (BirdLife International 2022e), Srebrno jezero – Golubac (BirdLife International 2022f), Srednje Potamišje (BirdLife International 2022g), Taložnik šećerane Kovin (BirdLife International 2022h), Ušće Save u Dunav (BirdLife International 2022i) and Vršački ritovi (BirdLife International 2022j).

Breeding population estimates and trends for Serbia were taken from BirdLife International (2021) or Puzović et al. (2015), whichever the latest. Wintering population estimates and trends for Serbia were taken from BirdLife International (2021). Percentages of the European populations in Serbia were calculated from the above estimates for Serbia and European population estimates from BirdLife International (2021).

6.3.3.11.7.2 Evaluation of Baseline Conditions - Flight activity

The flight activity of Target species was recorded during VP surveys and subsequently was mapped and quantified. After all visits had been completed, each target species flight trajectories were transferred onto separate species maps (Appendix C), which were then analysed to identify species spatial activity patterns and use of the WPP area.

Quantitative data on target species flight activity (Appendix C) were used to calculate various activity indices, according to NS's CRM (SNH 2000, Band et al. 2007), such as:

- It/h - total number of birds observed per survey hour (of the period species occurs at the site) [n/h],
- IC/h - number of birds observed at blade swept height per survey hour (of the period species occurs at the site) [n/h],
- Ot/h - total bird occupancy (birds x flight time) observed per survey hour (of the period species occurs at the site) [n x s / h],
- OC/h - bird occupancy observed at blade swept height per survey hour (of the period species occurs at the site) [n x s / h],
- rIC - share of birds observed at blade swept height [%],

- rOC - share of bird occupancy observed at blade swept height [%].

The WTG model was not selected at the time of writing, and blade swept height differs among the candidate models. The candidate model generating the highest collision risk is the one with the largest rotor diameter and chord width of blade – Siemens Gamesa SG 6.6-170, with two possible hub heights (115 and 155 m). Therefore, following precautionary approach, indices were calculated for two blade swept height scenarios accordingly, as applicable: 30-200 m and 70 240 m.

Activity indices were the input for CRM (SNH 2000, Band et al. 2007).

Activity indices were also used to identify, describe and analyse species temporal activity patterns and use of the WPP area.

6.3.3.11.7.3 Evaluation of Ecological Status

Bird species ecological status was defined through four key aspects and categorised as follows:

1. Occurrence:
    - Regular - recorded on most VP survey visits (of the period species occurs at the site) or nesting confirmed,
    - Occasional - recorded on several VP survey visits (of the period species occurs at the site),
    - Rare - recorded few times,
    - Incidental - recorded once or twice;
2. Abundance:
    - High - > 50 individuals recorded per survey visit,
    - Moderate - 10-50 individuals recorded per survey visit,
    - Low - 2-10 individuals recorded per survey visit,
    - Negligible - only single individuals recorded.
3. Seasonality:
    - Breeding - recorded only during the breeding season (March-August),
    - Migrating - recorded only on migration (February-April and/or August-October),
    - Wintering - recorded only on wintering (November-February),
    - Resident - recorded throughout the year,
    - not defined - not possible to define the seasonality due to scarce records.
4. Habitat use:
    - Nesting - nesting confirmed by breeding bird surveys or otherwise,
    - Foraging - foraging regularly recorded during VP surveys,
    - Resting - resting/perching regularly recorded during VP surveys,
    - Commuting - commuting overflights regularly recorded during VP surveys,
    - Passage only - only occasional overflights recorded during VP surveys.

When specific spatial and/or temporal patterns were identified, in order to define certain aspects more precisely, modifiers were used, such as: locally, just beyond site boundaries, locally, occasionally, rarely.

6.3.3.11.7.4 Nature Conservation Evaluation - Conservation Concern

Following bird species were considered as of conservation concern:

- Listed on The Bern Convention Appendix II (Official Journal of RS, No. 102/2007a);
- Listed on the CMS Appendix I or II (Official Journal of RS, No.102/2007b);
- Listed on the EU Birds Directive Annex I (Official Journal of EU [2009/147/EC]);
- Strictly Protected in Serbia (Official Journal of RS, No. 5/2010, 32/2016, 98/2016);

- Classified as Threatened (i.e., CR - Critically Endangered, EN - Endangered, or VU - Vulnerable) globally or regionally [in Europe] on the current version of the IUCN (2022) Red List of Threatened Species or in national Red Book (Radišić et al. eds. 2018;
- Bird species considered to be of conservation concern by BirdLife International (2017), either as SPEC 1 (European species of global conservation concern), SPEC 2 (species of European conservation concern whose global population is concentrated in Europe), or SPEC 3 (species of European conservation concern whose global population is not concentrated in Europe);
- Bird species triggering designation of relevant IBAs, though only if individuals from the particular IBA population of triggering species (possibly) occur at the site.

6.3.3.11.7.5 Nature Conservation Evaluation - Assessment of Nature Conservation Value

The nature conservation value of bird populations occurring at the WPP site was assessed based on their ecological status at the site and available population parameters (at relevant geographical scale) and then considered according to species/ population conservation status at the relevant scale.

6.3.3.11.7.6 Assessment and Evaluation of Impacts - Identifying Impacts

All potential impacts of the Project on birds (SNH 2017, 2018a, European Commission 2020, Bennun et al. 2021) were considered, as follows:

- Loss of habitat – direct degradation and/or fragmentation of habitats due to the construction of the WPP that results in complete or partial physical disappearance of habitat or deterioration of its functionality for birds;
- Displacement (i.e., indirect loss of habitat) – if birds avoid the WPP and its surroundings due to construction and/or operation, which may also include barrier effects;
- Mortality in nests – death or injury of birds or damage/ destruction of eggs due to accidental/incidental damage or destruction of nest or nest site whilst birds/eggs are present within;
- Collision mortality from WTG – death or injury through collision or other interaction with WTG blades;
- Illegal deliberate mortality – construction/maintenance staff could engage in illegal activities of deliberate capture or killing (e.g., poaching), and disturbance of protected bird species, as well as damaging or destruction of their development stages (including nests, eggs and hatchlings).

Impacts of the OHL were not considered since the Project does not include OHL (the grid connection will be through the existing Čibuk 1 substation).

6.3.3.11.7.7 Assessment and Evaluation of Impacts - Collision Risk Modelling

The risk of bird collision with operating WTGs was assessed using SNH Collision Risk Model (SNH 2000), with avoidance rate applied (SNH 2010, 2018b) and fully following appropriate recommendations for its application (Chamberlain et al. 2005, Band et al. 2007, SNH 2014a).

Collision risk modelling (CRM) is undertaken to further inform the magnitude of collision impacts on the bird populations that were recorded flying within the proposed WPP area. The model runs as a three-stage process. Firstly, the risk is calculated assuming that flight patterns and behaviours are unaffected by the presence of the WTGs i.e., that no avoidance action is taken. This is essentially a mechanistic calculation, with the collision risk calculated as the product of (i) the probability of a bird flying through the rotor swept area, and (ii) the probability of a bird colliding if it does so. This probability is then multiplied by the estimated numbers of bird movements through the WTG rotors at the risk height (i.e., the height of the rotating rotor blades) in order to estimate the theoretical numbers at risk of collision if they take no avoiding action.

A bird is simplified in shape to a flying cross with length, wingspan, and speed, and always flying perpendicularly towards the rotor. A bird may be ‘gliding’ i.e., with the arms of the cross fixed, or ‘flapping’ i.e., with the arms of the cross flapping so as to occupy a space similar to that of a spinning top, with the length of the bird being the axis of spin. ‘Gliding’ flight has a marginally lower collision risk than ‘flapping’ flight – notably for passage at points level with the rotor hub, where the wings lie parallel with potentially colliding blades. However, the difference is rarely sufficient to warrant detailed consideration of different bird behaviours. As a ‘worst case’ scenario, all flight data entered into the collision risk model is set to ‘flapping’ flight.

The second stage of the collision risk model incorporates the probability that the birds, rather than flying blindly into the WTGs, will actually take a degree of avoiding action. The most recent guidelines based on research at operational wind farms in the UK and Europe, advise that the default avoidance rates for all species is 98%

with the exception of a small number of species, including Common Kestrel, Lesser Kestrel and vulture species which are considered to have an avoidance rate of 95%.

It is important to note that whilst SNH figures are an accepted best practice avoidance rate it is clear that these are also likely to remain precautionary. Operational data from various wind farms worldwide has produced fatality monitoring data showing that higher rates of avoidance may be appropriate for a range of species. SNH themselves have only increased avoidance rates since the original provision of these figures and all indications are that this collision risk exercise, whilst following a best practice, is certainly providing a precautionary output.

Once the avoidance rate is incorporated, the model then predicts the likely number of annual collisions of each particular species. The number of predicted collisions (i.e., the extent) is then assessed against the total local, national or international populations as appropriate to ascertain the magnitude and hence significance of any impacts.

For the Čibuk 2 WPP, the modelling involved:

1. Estimation of the number of birds passing through the blade swept zone (expressed by appropriate activity indices, calculated from quantitative data on target species flight activity collected by VP surveys, for two scenarios according to different blade swept heights of the worst-case candidate WTG model;
2. Assessment of the probability of a bird colliding when flying through the rotor (calculated using SNH collision probability model, based on bird dimensions, flight speeds and WTG characteristics, again, in two variants according to different blade swept heights of the worst-case candidate WTG model);
3. Application of species-specific avoidance rate.

The result of the CRM is an estimated number of bird collisions likely to occur at a proposed WPP over a period of time, by target species (in three variants according to candidate WTG models).

6.3.3.11.7.8 Assessment and Evaluation of Impacts - Population Sensitivity and Sustainability

The sensitivity of bird populations potentially affected by collision mortality and displacement was estimated using the Potential Biological Removal ("PBR") approach as applicable for bird populations (Niel & Lebreton 2005, Dillingham & Fletcher 2008). PBR is considered best practice when Population Modelling (using population matrixes) is not possible due to the absence of detailed population-specific demographic data for potentially affected populations. The PBR calculations indicate:

- Allowable harvest rate, i.e., additional human-caused mortality rate likely to be sustainable for the particular population, and
- Maximum harvest rate, i.e., maximum mortality rate that could possibly be sustainable.

Calculated harvest rates were then compared with the mortality from collision (estimated by CRM) or population loss from displacement (as an equivalent of habitat loss) to determine if collision mortality or displacement is likely to be sustainable. Any human caused mortality is considered sustainable when below the allowable harvest rate, and unsustainable (detrimental) when above maximum harvest rate, whilst any value between these two critical rates would need further investigation (Dillingham & Fletcher 2008).

The precautionary approach was consistently implemented in PBR calculations undertaken in this Assessment, including:

- 80% confidence interval (1-α) of all population size estimates has been assumed,
- all mortality rates have been calculated against a conservative estimate of the population size (Nmin),
- the worst-case mortality rates from collision have been used and assuming that all the fatalities would be from the particular population,
- the total population loss from displacement has been used as an equivalent of habitat loss,
- recovery factor (a corrective coefficient applied to take into account the conservation status of the species/population at the relevant level) has been selected according to maximum precaution.

Arbitrary (non-population-specific) mortality thresholds, such as the so-called "1% mortality criterion" set up by European Commission (1993), were not used since scientifically disproved, "in Europe also questionable from a legal perspective", and thus rejected (SNH 2018b).

6.3.3.12 Bats

6.3.3.12.1 Survey Methodologies

Bat surveys within the scope of this ESIA were designed and undertaken in full compliance with the most relevant and up to date EUROBATS (Rodrigues et al. 2015), and as much as possible BCT (Hundt ed. 2012, Collins ed. 2016), guidelines, and included as follows:

- Investigation of roost sites (i.e., Roost Surveys),
- Manual bat detector surveys at ground level (transects) (i.e., Transect Surveys),
- Automated bat detector surveys at WTG locations (i.e., Automated Surveys).

Automated Activity Surveys at Height and Continuous Automated Bat Detector Surveys, recommended/required by EUROBATS (Rodrigues et al. 2015), were not successfully implemented, although originally included in the ESIA survey programme. The automated bat registration system was installed on the meteorological mast (with one microphone at approximate nacelle height of 100 m and another at 2 m height) and operated throughout the bat activity season 2022 (as soon the installation was possible). However, due to a technical error (memory card failure), only a few recordings, insufficient for purposeful analysis, could be retrieved.

6.3.3.12.2 Investigation of Roost Sites

The aim of Roost Surveys was to identify and assess bat roosts and potential roosting features within the survey area. EUROBATS (Rodrigues et al. 2015) methodology was used in these surveys along with the approach recommend by the BCT (Hundt ed. 2012, Collins ed. 2016).

Detailed surveys were carried within 200 m of the outermost WTG locations, as required, whilst evaluation of roosting potential was undertaken within a wider survey area – up to 2 km of the outermost WTG locations (Rodrigues et al. 2015), where indicated that bats from such roosts use the site (Hundt ed. 2012).

The preliminary roost assessment included the identification of potential roosting features. Buildings were identified through the national cadastre (Republičkigeodetski zavod 2020), satellite imagery (Google Earth Pro software, © Google LLC) and in the field. The identified potential roosts were then subjected to detailed visual external and internal daytime inspection for evidence of roosting bats, and, where needed, presence/ absence (night-time) surveys for behaviour indicative of roosting (emergence/ entering, swarming, display flights and display calls around/from the potential roost sites), to characterise roosts and/ or evaluate roosting potential.

The preliminary roost assessment was undertaken in January 2021, and each potential roosting feature has then been surveyed at least once in every season (breeding, mating and hibernation).

6.3.3.12.3 Manual Bat Detector Surveys at Ground Level (Transects)

The aim of Transect Surveys was to identify and assess the presence, activity levels, and habitat use of bat species across the survey area and it is required by all the relevant documents. EUROBATS survey methodology (Rodrigues et al. 2015) was consistently implemented in these surveys, as well as best practice principles (Brigham et al. eds. 2004, Fraser et al. eds. 2020).

Two transect routes along existing rough tracks were defined (Figure 6-2) to provide complete the spatial and ecological coverage of the WPP developed area (including the majority of all WTG locations), and to encompass all ecological features that are potentially important for bats. Each transect route was about 12.5 km long and was divided into 25 segments, each 500 m long (used for spatial analyses).

The transect routes were walked (or slowly driven) at a fairly constant speed of 3-3.5 km/h, with 5-minute stops at predefined spots, evenly distributed along the transect routes. Bat activity was observed by acoustic detection of bat calls using a hand-held bat detector, aided by visual observation to improve species identification and counts (Rodrigues et al. 2015). Preliminary species identification, the number of individuals, time, duration, location, flight height and direction (when possible) and observed behaviour were recorded on spot for each detected bat pass (contact). When a more precise species identification was required, bat calls were recorded. Recorded calls were subsequently analysed using specialized software, appropriate literature and the Consultant’s bat call library.

Transect Surveys were undertaken from April to November 2021, one survey visit per transect every ten days, i.e., 2-3 times per month depending on the weather conditions, on consecutive nights on two transect routes whenever possible.

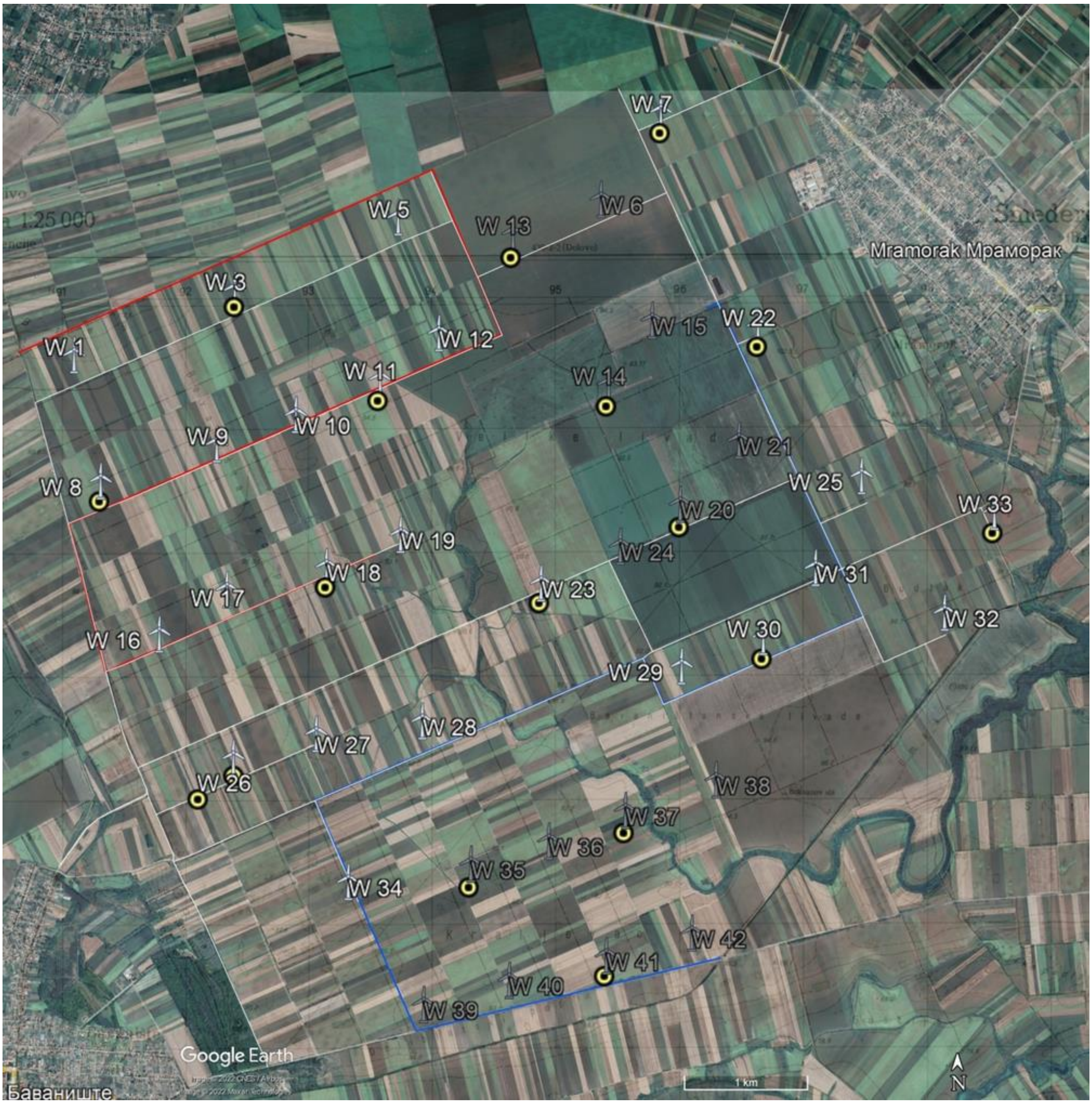

Figure 6-2 Spatial Setup of Bat Surveys

Source: Google Earth 2022, NES, with modification by B. Karapandža, original

Legend and notes: Routes of manual bat detector surveys at ground level – transects (blue - T1, red - T2); locations of automated activity surveys at ground level – surveyed WTG locations (yellow spots W); locations of WTGs of Čibuk 2 (W white) and Čibuk 3 (W grey), and Čibuk 2 site access tracks (white lines) are also shown.

6.3.3.12.4 Automated Bat Detector Surveys at WTG Locations

The aim of Automated Surveys was to identify and assess bat activity levels at a representative sample of WTG locations. EUROBATS survey methodology (Rodrigues et al. 2015) was consistently implemented in these surveys, as well as best practice principles (Brigham et al. eds. 2004, Fraser et al. eds. 2020).

A representative sample of 16 WTG locations (Figure 6-2) was surveyed. The sampled WTGs were selected based on expert judgement as to provide the coverage and representation of the developed area, both spatially and ecologically, as required by all the relevant guidance. The automated bat registration systems were operated from 30 minutes before sunset to 30 minutes after sunrise. The recordings were analysed using specialized software, appropriate literature, and Consultant's bat call library. Recorded calls were identified to the level of bat species groups – Rhinolophus spp., Myotis/ Plecotus/Barbastella spp., Pipistrellus/ Hypsugo/Miniopterus spp., Nyctalus/Vespertilio spp., and Eptesicus serotinus (plus indeterminable).

Automated Surveys were undertaken from April to November 2021, one survey visit per sampled WTG every ten days, i.e., 2-3 times per month depending on the weather conditions, on the same nights Transect Surveys were undertaken, as required.

6.3.3.12.5 Limitations to Surveys

Although recommended/required (Rodrigues et al. 2015), Automated Activity Surveys at Height and Continuous Automated Bat Detector Surveys were not successfully implemented. However, although potentially useful, the lack of data from these surveys does not impede the reliable assessment of impacts on bats.

The Transect and Automated Survey methodologies used in this assessment, can only very rarely reliably attribute the observations of certain species groups to particular species, by either visual features or analyses of acoustic signals (e.g., Paunović et al. 2011, Boonman et al. 2009, Limpens 2010). It is therefore standard procedure (Collins ed. 2016, Rodrigues et al. 2015) that these are considered as species groups – Myotis myotis/blythii, Myotis brandtii/mystacinus, Myotis emarginatus/alcathoe and Plecotus spp. However, this does not impede impact assessment, since each group consists of sibling species, taxonomically close and ecologically similar (Dietz et al. 2009, Paunović et al. 2011), and thus WPP projects have the same expected impacts on them, including collision risk level (Rodrigues et al. 2015).

The required period for all bat activity surveys is March to November in this part of Europe, according to EUROBATS (Rodrigues et al. 2015). However, due to prolonged period of adverse weather conditions in surveyed activity season 2021, the bat activity, as well as Transect Surveys and Automated Surveys accordingly, commenced in late April, which is considered to be fully compliant.

Transect Surveys, as well as Automated Surveys undertaken in parallel according to implemented methodology, should be carried out once every 10 days (Rodrigues et al. 2015). On the other hand, these surveys cannot be undertaken in inadequate weather conditions – temperature below 7ºC, wind speed above 5 m/s, intense and long-lasting rain and/ or fog (Rodrigues et al. 2015). During the ESIA survey period, there were several occasions when surveys were not possible for periods longer than 10 days due to continuously inadequate weather conditions. On such occasions, the next survey visit was always undertaken as soon as weather conditions sufficiently improved. Therefore, it is considered that, under given conditions, these surveys were carried out in full compliance with applicable requirements.

The automated bat registration systems used in Automated Surveys, occasionally failed to record bat activity during parts or occasionally the entire night, due to various reasons (moisture, malfunctions, technical problems, etc.). However, since the proportion of failed recordings was less than 2% with no bias for any of the surveyed WTG locations, this had no effect on the total sample. Accordingly, it is considered that these surveys provided a complete and thorough insight into bat activity at the WTG locations throughout the bat activity season and provides reliable input for the impact assessment.

6.3.3.12.6 Evaluation and Assessment Methodology

6.3.3.12.6.1 Evaluation of Baseline Conditions - Populations

It is important to note that, in line with international standards, the ESIA surveys were not designed to determine the absolute abundance of bat populations (i.e., population size) at the WPP site area. Activity surveys (bat detector based) that were adopted “provide a number of bat passes rather than absolute number of bats” (Rodrigues et al. 2015, Collins ed. 2016, Fraser et al. eds. 2020). The indices used to quantify bat activity and relative abundance from the activity surveys data should not be interpreted as a direct measure of population size (Hundt ed. 2012, Collins ed. 2016). However, some of these indices can be informative of the species abundance if calculated and interpreted adequately (as elaborated below), and bat populations using the WPP site were estimated, where possible, based on the survey results.

Bat populations roosting at the WPP site (and immediate surroundings) were estimated, where possible, based on the results from the Roost Surveys.

Population estimates and trends for Serbia were taken from Paunović et al. (2020), whilst not available at any other level (geographical scale), including local, regional, European and global (IUCN 2022, Rodrigues et al. 2015). Regional (South Banat) populations were estimated based on the national populations, current knowledge and expertise.

6.3.3.12.6.2 Evaluation of Baseline Conditions - Flight activity

Bat pass (or contact) was used as a standard measurement unit of observed/ recorded bat flight activity (Rodrigues et al. 2015, Collins ed. 2016), defined as follows:

- Transect Surveys –bat activity when the target did not definitely leave the audio-visual range of the surveyor was regarded as a single pass, or as many passes as many individuals have been positively observed simultaneously (Limpens 2010);
- Automated surveys – series of successive pulses (two at least) separated from other such series by at least 1.1 seconds (according to technical features and settings of the automated system used) was regarded as a single pass, or as many passes as many individuals have been positively identified within the same time interval.

According to implemented guidance (Rodrigues et al. 2015, Hundt ed. 2012, Collins ed. 2016) and best practice (e.g., Brigham et al. eds. 2004, Barataud 2015, Fraser et al. eds. 2020), bat flight activity recorded (Appendix C) by Transect Surveys and, as applicable, by Automated Surveys, was quantified using the following indices:

- AI - activity index, number of bat passes recorded per time unit [contacts/h];
- cA - relative abundance, percentage of passes attributed to particular species/group of the total passes identifiable to the highest applicable species/group level, corrected by species-specific detectability coefficient [%];
- F% - the percentage of passes with feeding behaviour or feeding buzz registered of the total passes recorded [%];
- aD - average duration of pass [s];
- SC% - the percentage of passes with social call registered of the total passes recorded [%].

Activity indices can be calculated for any given time period, or any given area, per species/ groups or total, and are used to identify, describe and analyse bat temporal and spatial activity patterns.

Seasonal changes of activity were analysed to identify distinctive patterns indicative of particular phenomena in this part of Europe (Bartonička & Zukal 2003, Dietz et al. 2009, Rodrigues et al. 2015, Paunović et al. 2011, 2020), such as:

- Activity peaks in late summer and early autumn (during or just after the period of autumn migration when an influx of migratory populations is expected), and at the very beginning of the activity season (before the spring migration, when migratory populations are still present) are indicative of an occurrence of migratory population.
- Activity minimum in early autumn (during or just after the period of autumn migration when an efflux of species swarming elsewhere is expected), followed by absence later in autumn (when swarming takes place), are indicative of an occurrence of (breeding population of) short-distance migratory swarming species.
- Activity minimum in late spring – early summer (during the period of birthing and lactation) followed by a peak in midsummer (when ca. 1-month-old juveniles fledge and wean) is indicative of reproductive (nursing) activity of the occurring population.

Activity indices, in conjunction with visual observations, have been analysed to identify distinctive patterns indicative of particular aspects of habitat use (Bartonička & Zukal 2003, Dietz et al. 2009, Rodrigues et al. 2015, Collins ed. 2016, Paunović et al. 2011, 2020), such as:

- Higher values of F% and aD, associated with higher AI are considered indicative of foraging area.
- Lower values of F% and aD, associated with higher AI, as well as with pronounced unidirectionality and spatial focus of flights along particular habitat/landscape feature, at the beginning or at the end of daily activity in particular, are considered indicative of commuting route.
- Lower values of F% and aD, associated with higher AI, as well as with observation of large flocks and pronounced unidirectionality and spatial focus of flights along particular habitat/landscape feature during spring and/or autumn migration season, are considered indicative of migration route.
- Higher values of SC%, associated with higher AI and spatial focus of flights around particular habitat/landscape structure/feature are considered indicative of either display (i.e., mating or courtship) territory, where s single male is observed in display flight, or swarming site, where more individuals

congregate, (and mating roost within them, which is typically also used as hibernation roost afterwards).

- Regular earlier beginning and later ending of daily activity in a certain area, associated with an identified commuting route in particular, and possibly with the swarming behaviour observed at the end of daily activity as well, are considered indicative of proximity to roost.

Due to inherent species-specific differences in bat call intensity, the probability of acoustic observation/ recording differs among species (Barataud 2015, Collins ed. 2016, Rodrigues et al. 2015). Species-specific call intensity differs also between habitats in relation to structure, defined mostly by vegetation density, being lowest in clutter and highest in open space. Species-specific detectability coefficients, based on the maximum distance of detection, have been calculated for different habitats; applying these coefficients to observed/ recorded activity (or indices) per species allows comparison of the activity between species (Barataud 2015, Rodrigues et al. 2015). Relative abundance was used in this assessment to compare the activity between species, and thus detectability coefficients have been applied when it has been calculated. Species-specific detectability coefficients for open habitats, such as at the site, were used (Appendix C).

Thus, adequately calculated relative abundance can also be informative of the species abundance if interpreted in conjunction with visual counts, roost surveys and other observations and survey findings (Hayes 2000, Rodrigues et al. 2015, Collins ed. 2016), as well as taking the ecological context and species ecology (Dietz et al. 2009, Paunović et al. 2011, 2020) into consideration.

6.3.3.12.6.3 Evaluation of Ecological Status

Bat species ecological status has been defined through five key aspects and categorised as follows:

1. Occurrence:
   - Regular - recorded on most survey visits,
   - Occasional - recorded on several survey visits,
   - Rare - recorded few times,
   - Incidental - recorded once or twice;
2. Activity:
   - Very High - AI > 30 contacts/h,
   - High - AI = 10-30 contacts/h,
   - Moderate - AI = 5-10 contacts/h,
   - Low - AI = 1-5 contacts/h,
   - Negligible - AI < 1 contacts/h.
3. Abundance:
   - Very High - cA > 50 %,
   - High - cA = 10-50 %,
   - Moderate - cA = 5-10 %,
   - Low - cA = 1-5 %,
   - Negligible - cA < 1 %.
4. Migratory status:
   - Resident,
   - Migratory,
   - Undetermined;
5. Habitat use:
   - Roost(s),
   - Foraging area(s),
   - Commuting route(s),

- Migration route(s).

When specific spatial and/or temporal patterns were identified, in order to define certain aspects more precisely, modifiers were used, such as: locally, just beyond site boundaries, occasionally.

6.3.3.12.6.4 Nature Conservation Evaluation - Conservation Concern

Following bat species were considered as of conservation concern:

- Listed on The Bern Convention Appendix II (Official Journal of RS, No. 102/2007a);
- Listed on the CMS Appendix I or II (Official Journal of RS, No.102/2007b);
- Listed on the EU Habitats Directive Annex II or IV (Official Journal of EU [1992/43/EEC]);
- Strictly Protected in Serbia (Official Journal of RS, No. 5/2010, 32/2016, 98/2016);
- Classified as Threatened (i.e., CR - Critically Endangered, EN - Endangered, or VU - Vulnerable) globally or regionally [in Europe] on the current version of the IUCN (2021) Red List of Threatened Species or on national Red List (Paunović et al. 2020).

6.3.3.12.6.5 Nature Conservation Evaluation - Assessment of Nature Conservation Value

The nature conservation value of bat populations occurring at the WPP site was assessed based on their ecological status at the site and available population parameters (at relevant geographical scale), using matrix presented in Table 6 3, and then pondered according to species/population conservation status at the relevant scale (see section 6.3.3.11.2.5).

6.3.3.12.6.6 Assessment and Evaluation of Impacts - Identifying Impacts

All potential impacts of the Project on bats (Rodrigues et al. 2015, Hundt ed. 2012, European Commission 2020, Bennun et al. 2021) were considered, as follows:

- Disturbance from construction (through turmoil, vibrations, noise, and lighting);
- Loss of habitats to construction of WPP infrastructure, in particular: loss of roost sites, loss of foraging areas, and loss or disturbance of flight paths (commuting and migration routes);
- Mortality in roosts - death or injury of bats due to accidental/incidental damage or destruction of roost sites (through construction) whilst bats are present within them.
- Operational mortality - death or injury through collision or barotrauma caused by operating WTG blades.

Displacement (i.e., indirect habitat loss) of bats due to avoidance of operating WPPs is not considered since it has been plausibly disproved (Rodrigues et al. 2015).

All of the potential impacts on bats are negative, except possibly for the habitat changes that may have ambiguous effects depending on species (Rodrigues et al. 2015, Voigt et al. 20185, European Commission 2020, Bennun et al. 2021).

6.3.3.12.6.7 Assessment and Evaluation of Impacts - Risk of Operational Mortality from WTGs

The risk of bat mortality from operating WTs is not predictable or quantifiable from the pre-construction surveys activity data in a way bird collisions are. “[T]he highest mortality is expected in areas of [regularly] greatest bat activity such as migration and commuting routes, important foraging areas, and close to bat roosts, particularly for species and populations that are at higher risk due to their specific ecology” and “the mortality risk is considered particularly high for migratory populations” (Rodrigues et al. 2015). “When wind farms are constructed within forests the impacts can be exacerbated”, and thus “wind turbines should not be installed within all types of woodland or within 200 m” (Rodrigues et al. 2015). Therefore, the collision risk is estimated qualitatively on the basis of occurring populations’ ecological statuses and habitat use at the site, and species specific susceptibility to collision with WTs (Rodrigues et al. 2015).

6.3.3.12.6.8 Assessment and Evaluation of Impacts - Population Sensitivity and Sustainability

Since modelling of bat mortality from operating WTGs is not possible, qualitative assessment of the impact has been undertaken. The overall sustainability limits of potentially affected population(i.e., population-specific mortality thresholds) at relevant scale (regional or higher) have been estimated using PBR methodology. The PBR method as adapted to birds (Niel & Lebreton 2005, Dillingham & Fletcher 2008) is scientifically proven to be applicable for mammals in general (Dillingham *et al.* 2016) and bats in particular (Haider *et al.* 2017), and even recommended to assess impacts of operational mortality from WPPs on bat populations (Diffendorfer *et* *al.* 2015). Since all the population parameters needed for the PBR calculations (for the purpose of this particular assessment) have been available, the PBR method has been used to assess sustainability limits of bat populations in this ESIA.

Arbitrary (non-population-specific) *mortality thresholds*, such as the so-called "1% mortality criterion" set up by European Commission (1993) for birds, were not used as these have been scientifically disproved, "in Europe also questionable from a legal perspective", and thus rejected (Rodrigues *et al.* 2015).

6.3.3.13 Cumulative Impacts

Each potential cumulative impact across all ecological feature (population and habitat) identified as of significant nature conservation value was assessed, as required (IFC 2013, CIEEM 2016, SNH 2012, 2018a, Hundt *ed.* 2012, Collins *ed.* 2016, Rodrigues *et al.* 2015).

The Rapid Cumulative Impact Assessment (RCIA) approach set out by IFC (2013) was followed considering general aspects, being the most applicable to the Project and information availability, and also to maximise compatibility with previous IFC's South Banat Region Wind Power Projects RCIA (IFC 2019b). Previous RCIA included three of the WPPs in the region, and this Assessment built upon it. However, the same assessment and evaluation methodology, as well as terminology, was used as for Project's individual impacts, to ensure consistency throughout the ESIA. Relevant SNH (2012) guidance was followed regarding specifics of cumulative impacts assessment, with adaptation to Serbian context and information (un)availability.

24 bird and 7 bat populations defined as **priority Valued Environmental and Social Components (VECs)** in previous RCIA (IFC 2019b) were regarded as such in this Assessment as well. Priority VECs were subjected to detailed assessment, as required (IFC 2013, SNH 2012), whilst all other potentially affected ecological features were considered more generally.

Previous RCIA's **temporal scope** – an initial three-year time frame from the start of WPP operations (IFC 2019b), was adopted as well. However, a wider area than in the previous RCIA, comprising the entire South Banat region, was considered a more appropriate **spatial scope** according to relevant criteria (IFC 2013, 2012c, SNH 2012). The entire region has been identified as potential AoI of the Project on (at least some of the) bird and bat species populations, priority VECs in particular, and thus appropriate geographic and ecological scale at which cumulative effects should be assessed.

All existing or planned WPPs within the defined scope and potentially affecting identified priority VECs were considered. Although not significant residual effects have been assessed for each individual WPP project in the South Banat region for which such information is available, considering the cumulative number and scale of relevant projects (Table 9-4, Figure 9-2), cumulative effects could be significant. Therefore, a detailed assessment of the cumulative impacts of South Banat WPPs on bird and bat populations was considered needed.

A complex combination of factors influences any development impacts on biodiversity, and these can only be reliably and specifically assessed on a project-by-project basis. However, WPP projects within the scope of this cumulative assessment differ in data availability (Table 6-4), but also in survey and assessment methodologies and presentation of findings. Therefore, assessment of cumulative effects that would be based on specific, comparable and quantitative information on each of the relevant project's impacts was not possible.

However, since all WPP projects in the South Banat region are developed in the very similar ecological setting and in the same habitat type, and since the nature of their impacts is the same, it was considered reasonable to approximate that the magnitude of impacts of each project will be roughly proportional to particular project size. Therefore, in the absence of complete, specific and quantifiable information on all projects, this assessment of cumulative effects was based on such approximation. This means that information on impacts from those projects where such information is available, was extrapolated to all South Banat region WPPs, as suggested by Diffendorfer *et al.* (2015). Particular caution was taken to avoid any excessive over-or under-estimates that may arise from any project-and-site-specific issues, and all additional available information considered that may be of relevance. Although it is recognised that this approach may not be precise, it is considered more informative of the potential cumulative effects risks than any qualitative analysis.

Table 6-4 WPP Projects in the South Banat Region with an Overview of Available Information

Legend and notes:
C - complete information (includes quantitative data, as applicable), p - partial information (includes only qualitative data),
- - information not available.

WPP Project	Sources	Technical WPP data	Baseline		Impacts	
			Birds	Bats	Birds	Bats
Kovačica 1	WSP 2013, Karapandža & Paunović 2013, IFC 2019, Karapandža *et al*. 2019, 2020	C	C	C	C	C
Čibuk 1	Atkins 2014, IFC 2019, Karapandža & Paunović 2018, 2019c	C	C	C	C	C
Alibunar + Malibunar	EcoLogica Urbo 2013, IFC 2019	C	p/C	C	p/C	C
Košava 1 + La Piccolina	www.fintelenergija.rs/en	C	-	-	-	-
Alibunar A + B	Biotope 2012, 2013	C	p/C	C	p/C	C
Bela Anta 1	Eko Plan 2016	C	p/C	C	p/C	C
Plandište	Karapandža *et al*. 2022a	C	C	C	C	C
Pupin	Iles *et al*. 2021b, Karapandža *et al*. 2021b	C	C	C	C	C
Crepaja	Untermolo 2020b	C	-	-	-	-
Banat 1	JP Zavod za urbanizam Vojvodine 2019	C	-	-	-	-
Bela Anta 2	Eko Plan 2016	C	p/C	C	p/C	C
Vetrozelena	JP Urbanizam Pančevo 2020, Abkons & Arup 2022	C	-	-	-	-
Vetropark 1	Official Journal of City of Pančevo 13/2021a	C	-	-	-	-
BNS	Official Journal of City of Pančevo 13/2021b	C	-	-	-	-
WV NBT Wind 1	Official Journal of City of Pančevo 13/2021c	C	-	-	-	-
Vetroelektrana	Official Journal of City of Pančevo 19/2021	p	-	-	-	-
Čibuk 3	this Report	C	C	C	-	-
Čibuk 2	**this Report**	**C**	**C**	**C**	**C**	**C**

For impacts assessed quantitatively (such as habitat loss, bird displacement and collisions of target bird species), assessment of cumulative effects was undertaken in three stages, as follows:

1. Calculation of average relative magnitude of the impact, by quantification of assessed impact of individual projects (for which such information is available) in relation to their number of WTGs or total potential power output (i.e. per WTG or MW), depending on the impact (as elaborated for each impact);
2. Calculation of magnitude of the cumulative impact of all South Banat region WPPs, by extrapolation of average relative magnitude, multiplying by total number of WTGs or total potential power output of all South Banat region WPPs;
3. Assessment and evaluation of cumulative impact according to implemented methodology (as elaborated in previous sections), to estimate the effect of the particular cumulative impact on sustainability of potentially affected population at relevant scale (regional, or higher, as applicable) using PBR methodology.

For impacts assessed qualitatively, though still with quantifiable thresholds at regional scale (such as bat operational mortality), as recommended in such cases (IFC 2013), and implemented for bird populations in previous RCIA (IFC 2019), the reverse approach has been applied: the overall sustainability limits of potentially affected population (i.e. population-specific mortality thresholds) at relevant scale (regional or higher) were estimated using PBR methodology.

In the absence of detailed demographic data for potentially affected populations, the PBR method is widely accepted and used to estimate sustainable mortality rates of bird populations, as was in previous RCIA (IFC 2019b). It is also applicable for bats (Haider et al. 2017), and even recommended to assess impacts of cumulative operational mortality from WPPs on bat populations (Diffendorfer et al. 2015), when population parameters needed for the PBR calculations are available.

6.3.4 Noise and Vibration

6.3.4.1 Baseline Noise Levels

Čibuk 2 is set in a rural area but it is close to villages to the north-west, north-east, and south-west. The nearest houses in each of these villages have been selected as noise-sensitive receptors. The villages and associated roads and farming activity will each provide a component of the background noise, but such noises occur mainly during the daytime. At night, noise from human activity will diminish and baseline noise levels will be largely determined by natural sources such as the wind passing through the local vegetation. This will be dependent on the wind speed.

The northern part of Mramorak and the eastern outskirts of Dolovo and other isolated houses will be effected by noise from the existing Čibuk 1 WPP.

Baseline Noise Survey

A baseline noise survey was carried out by Zaštita Beograd to establish noise levels at locations representing the nearest settlements to this project. This was done at five locations with a minimum of two weeks monitoring at each location. The full survey report is provided in Appendix D.3. The findings are summarised below.

The five measurements locations are listed in the following table.

Table 6-5 Locations for Baseline Measurements

Location	Receptor Co-ordinates UTM		Description	Survey Period
	X	Y		
Dolovo	490680	4970609	In the vegetable garden / orchard of a house to the south of the village.	26th May to 9th June 2022
Mramorak North	496989	4970580	In the vegetable garden of a house to the north of the village in view of the Čibuk 1 turbines.	2nd to 17th June 2022
Mramorak South	497887	4968598	In the garden of a house to the south-west of the village	2nd to 16th June 2022.
Bavanište Monastery	491613	4963829	In the vegetable garden of the monastery in a clearing between trees.	18th May to 1st June 2022
Bavanište North	490418	4964463	In the orchard of a house north-east of the village	18th May to 1st June 2022

Measurements were carried out using Brüel & Kjær Type 2250 and Type 2270 sound level meters and calibrated using Brüel & Kjær Type 4231 calibrators.

The survey was carried out in consecutive 10-minute periods to obtain data over the operational wind speed range of the wind turbines. Wind speed data, also in 10-minute periods, was taken from the on-site meteorological mast. This had anemometers set at various heights. The data from the anemometers has been used to calculate the wind speed at the proposed hub height (160m) by extrapolation based on the power law describing the variation of wind speed with height.

Turbine noise levels are measured in relation to the hub height wind speed. The hub height wind speed data is then standardised to 10m height using the “log-law” formula with a ground roughness of 0.05m. Turbine sound power data are also stated with reference to the standardised wind speed. Therefore, by stating the background noise levels in relation to the same reference, the results are directly comparable and wind shear is taken into account. This procedure is in accordance with the recommendations of the UK Institute of Acoustics Good Practice Guide (IoA GPG)[7] which requires the effects of wind shear to be taken into account.

Data Processing

The wind speed and noise measurements have been correlated to show the variation in noise with the standardised wind speed. Rainfall is also plotted. From these results some data has been excluded where the data did not obviously follow the variation in wind speed. This may have been local activity close to the microphone. Periods with rain have also been removed.

The valid data was then divided into the daytime 06.00 – 22.00 hours and night-time 22.00 to 06.00 hours and a scatter plot obtained for each location showing the variation in noise with wind speed. The prevailing background noise level from the scatter plots has been derived with a 2nd or 3rd order polynomial trendline fitted to the data. Scatter plots showing the data are provided in Appendix D.4.

Operational Noise Impact Modelling

For this project, operational noise levels have been predicted using *ISO 9613-2: Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation*. The standard allows noise levels to be predicted for short-term downwind conditions, i.e. for wind blowing from the proposed turbine towards the houses. This provides a typical worst case in terms of propagation because when the wind is blowing in the opposite direction, noise levels will be significantly reduced compared with the downwind case.

Noise from wind turbines is reduced by distance, atmospheric losses, screening effects (if present) and other 'miscellaneous' losses. Noise levels can be increased or reduced by the interaction of the sound waves with the ground. The ISO propagation model calculates the predicted sound pressure level at a specified distance by taking the sound power level in octave frequency bands and subtracting a number of attenuation factors according to the various losses and the ground effect as described above. The noise level in each octave band can be represented by equation 1 below:

$$\text{Predicted Level } L_{eq} = L_{W(eq)} + D - A_{geo} - A_{atm} - A_{gr} - A_{bar} - A_{misc} \qquad \text{(Equation 1)}$$

The predicted octave band levels from each of the turbines are then summed together to give the overall 'A' weighted predicted sound level from all the turbines acting together. The attenuation factors in the calculation (A_{geo} etc.) are described in Appendix D.

For this study, noise from the existing Čibuk 1 WPP has been considered as the assessment against wind turbine noise limits should be made for all turbines in the area.

Using the standard above can give rise to variable results depending on the input parameters chosen. To provide better consistency in the calculation results, and to provide a reasonable correlation with measured results, the IoA GPG stipulates the input parameters which can usually result in reliable predictions.

In accordance with the IoA GPG, the following input parameters and assumptions have been adopted for this scheme:

- Downwind propagation in respect of all turbines and other WPPs;
- Turbine sound power levels include a +2dB allowance for uncertainty;
- An assumption of 'Mixed ground' (G=0.5, that is neither wholly absorptive or reflective) is set to calculate the ground effect (A_{gr}) with a receiver height of 4m;
- Air absorption calculated using a temperature of 10°C and 70% relative humidity;
- Screening losses are limited to a maximum value of 2dB with the source modelled at the tip of the source turbines. There are no screening losses in this case as the terrain is largely flat.

Modelling Traffic Noise

The methodology described in the UK Calculation of Road Traffic Noise (CRTN)[8] is used. This provides two equations to describe the increase in noise levels associated with construction traffic, referred to below as Equations 1 and 2:

[7] UK Institute of Acoustics (2013) A Good Practice Guide to the application of ETSU-R-97 for the assessment and rating of wind farm noise
[8] UK Department of Transport (1988) Calculation of Road Traffic Noise (CRTN)

Increase due to increased flow: $10\,log(\frac{q_1}{q_0})$ (1)

Increase due to percentage HGVs $10\,log(1+\frac{5p_1}{V}) - 10\,log(1+\frac{5p_0}{V})$ (2)

In the above, q_1 and q_0 are the traffic flows with construction and the baseline flows respectively and p_1 and p_0 are the percentage of heavy vehicles for the construction year and baseline year respectively and v, the traffic speed in km/h.

Noise Limits and Significance Criteria

The WPP must meet the Serbian noise limits (see Appendix F). This represents a pass/ fail significance test. However, noise impacts can occur at lower levels and the ESIA process aims to identify effects at lower thresholds. For this project, following the IFC EHS guidelines, a significant effect can be identified in relation to the background noise level as assessed using the L_{A90} parameter. While the 2007 guidelines indicate that the increase in background noise should be limited to 3dB, the 2015 Wind Energy Guidelines set a threshold of 35 dB L_{A90} for determining a more detailed assessment.

Background noise levels vary with wind speed. At low wind speeds, low background noise levels would occur but constraining the wind farm to 3dB over a low level is not practical. Instead, it is proposed to define a moderate significance effect at 35 dB L_{A90} or 3dB over the background noise, whichever is the greater.

This limit is similar in approach to the UK ETSU-R-97 noise limit, although the UK lower daytime limit would allow a maximum increase of 5 dB(A) over the background noise (or 35 dB L_{A90}) whichever is the greater. For larger schemes there is also a higher UK limit of 40 dB L_{A90} or 5 dB above the background whichever is the greater. In this context, and in the context of other international wind energy limits and the WHO European Region guidance, it can be seen that the limit of 3dB over the background recommended in the IFC guidelines is an onerous standard. The significance effects can be set out in Table 6-6 below:

Table 6-6 Noise Effect Significance

Significance Rating	Effect	Noise Criterion
Major	Where the proposed development could be expected to have a very significant impact on the nearby noise-sensitive receptors	Serbian Residential Noise Limits (55 dB LAeq daytime & 45 dB LAeq night-time)
Moderate	Where the proposed development could be expected to have a small impact on the nearby noise-sensitive receptors	Where wind turbine noise levels exceed the greater or 35 dB LA90 or the background noise (dB LA90) + 3dB
Minor	Where the proposed development could be expected to have a small impact on the nearby noise-sensitive receptors	Where wind turbine noise levels exceed the background noise (dB LA90)
Negligible	Where there is no discernible impact on noise sensitive receptors	Where wind turbine noise levels do not exceed the background noise (dB LA90).

Noise during Construction and Decommissioning

Construction noise levels generally have a negligible effect in this case because it takes place some distance from the receptors and is short term in nature. Noise emissions from construction equipment will be limited by the Serbian legislation and a Construction Environmental and Social Management Plan (CESMP) will be prepared to ensure that construction noise is controlled. This will include best practical means measures to reduce noise. The construction activity on site will be far from residential receptors. However, there can be effects to construction traffic on local roads. This has been assessed by calculating the increase in traffic noise arising from the increase in flows. Criteria for assessing the increase in traffic are available in the UK design manual for roads and bridge (DMRB)[9]. This gives the following significance thresholds for short-term changes in traffic noise (dB):

- Major Adverse >5dB

[9] UK Standards for Highways, Design Manual for Roads & Bridges (2020) LA 111 Noise and Vibration

- Moderate Adverse 3.1 dB – 5 dB
- Minor Adverse 1.1dB – 3 dB
- Negligible 0 dB – 1 dB

6.3.5 Landscape and Visual

6.3.5.1 Introduction

The methodology for the Landscape and Visual Impact Assessment ("LVIA") is in accordance with the following best practice guidance:

- Siting and Designing Windfarms in the Landscape, Version 3a, Scottish Natural Heritage (August 2017);
- Guidance: Spatial Planning for Onshore Wind Turbines – Natural Heritage Considerations, (2015);
- Guidance: Assessing the Cumulative Impact of Onshore Wind Energy Developments, Scottish Natural Heritage (2012);
- Visual Representation of Windfarms Version 2.2, Scottish Natural Heritage (February 2017); and
- Photography and Photomontage in Landscape and Visual Impact Assessment - The Landscape Institute, Advice Note 01/11, March 2011, and consultation draft 2018.

The assessment included the preparation of initial Zone of Theoretical Visibility ("ZTV") plans, field work, establishing the LVIA Study Areas with the help of ZTV plans, initial proposal of representative viewpoints and their final selection during the fieldwork, photography and preparation of visualisations, and evaluation of landscape and visual effects and their significance.

A 30km Study Area is defined for consideration of potential receptors and cumulative windfarms. The rationale for the LVIA Study Area is described in Section 6.2.2.

6.3.5.2 Zone of Theoretical Visibility

The analysis of Zones of Theoretical Visibility (ZTVs) has been a starting point in the determining the potential landscape and visual effects of the proposed Čibuk 2 WPP and identifying potentially affected sensitive visual receptors.

The ZTV maps were prepared using Geographic Information System (GIS) software (ESRI ArcGIS 10.7.1) based on the Shuttle Radar Topography Mission Digital Elevation Model (SRTM DEM) of 30m interval resolution. To compensate for potential inaccuracies in digital terrain data and to ensure that the worst-case is represented, observer's eye level was set to 2.0m.

The ZTV overviews for the project are shown on a 1:250,000 base map based on the WTG height to hub (hub height ZTV) and height to blade tip (blade tip ZTV).

The general Study Area suggested by the SNH for assessment of cumulative effects is a 35km radius from the proposed site up to a 60km radius, depending on specific landscape and visual settings[10]. The extent of the Study Area should be adjusted to focus on significant landscape and visual effects.

6.3.5.3 Viewpoints

Representative viewpoints have been selected in an iterative process that started during the scoping exercise. A preliminary list of proposed viewpoints was developed during the scoping phase, based on the visibility indications of the hub height and blade tip ZTV plans.

The following criteria for viewpoint selection were applied: (1) visibility from settlements, (2) visibility from designated natural or cultural heritage sites, (3) visibility from roads, (4) visibility from recognised viewpoints, (5) visibility from recreation areas.

The initial list of viewpoints has been refined by using wirelines to exclude the viewpoints which showed similar results or indicated that potential effects would not be significant. The objective has been to choose viewpoints which represent several of the issues from the same location as this would reduce the total number of

[10] SNH - Assessing the Cumulative Impact of Onshore Wind Energy Developments (2012), page 13

viewpoints. The viewpoints have been chosen to represent a variety of landscape types and views from different directions and distances.

6.3.5.4 Field Survey

To establish the visual baseline and finally check the relevance of the proposed representative viewpoints the ZTVs accuracy was tested during the field work.

The field survey was carried out in early November 2022 to check the accuracy of the ZTVs and visit the proposed viewpoint locations. The work was undertaken during periods of very good visibility (visibility between 20km and 40km). The field survey included travelling around the LVIA and CLVIA Study Areas to consider potential effects on landscape character and visual receptors.

The photographs were taken in accordance with SNH Visual Representation of Windfarms (2017) using a SLR digital camera with a full frame (35mm) CMOS sensor and a 50mm fixed focal length lens. All photography was taken using a tripod mounted camera at a viewing height of 1.5m, and location data recorded with a hand-held GPS.

6.3.5.5 Visualisations

A range of visualisations (photographs, photomontages and wirelines) were used to illustrate the viewpoint assessment, in accordance with SNH Visual Representation of Windfarms (2017).

The baseline photographs were taken with an overlap between frames and were digitally stitched using PTGui® software to create fully cylindrically projected baseline panoramas of the 90-degree field of view. Minor enhancements to contrast and brightness were made on baseline photographs.

The photographs were also joined using PTGui® software to create planar projection panoramas used in the creation of the 53.5-degree field of view photomontages. Photomontages were created with WindPro 3.6 software.

Matching wireline representations were used in the assessment to predict the theoretical appearance of the turbines. The wirelines were produced with WindPro 3.6 software and are based on a digital terrain model with a 20m grid.

The baseline photographs, wireline visualisations and photomontages are prepared to be printed on paper 841mm x 297mm (half A1) and should be viewed flat at a comfortable arm's length.

6.3.5.6 Evaluation of Effects and Criteria of Significance

The significance of landscape and visual effects has been assessed separately. However, it has been based upon the same principle - a combination of two considerations: the sensitivity to change of the landscape receptor or visual receptor and the magnitude of change that would result from the proposed windfarm.

The level of identified impact concerns the importance of changes resulting from the Project. Evaluation of the impact is based on consideration of the magnitude of change in relation to sensitivity and is established using professional judgement. The assessment takes into account likely changes to the visual composition, including the extent to which new features would distract or screen existing elements in the view or disrupt the scale, structure or focus of the existing view.

The prominence of the WTGs in the view will vary according to the prevailing weather conditions. The assessment has been carried out, as is best practice, by assuming the ‘worst case’ scenario i.e. on a clear, bright day in summer.

6.3.5.7 Sensitivity of Landscape and Visual Receptors

The sensitivity of landscape depends on susceptibility to change and value of the landscape receptor. It has been defined as High, Medium, Low or Negligible, based on professional judgment and by considering factors that are typically used to identify the landscape value: distinctiveness, scenic quality, rarity, tranquillity, sense of place, recreation value, cultural associations, etc.

Due to the lack of official national studies, the sensitivity of landscape character areas has been considered based upon the literature, professional judgement and its ability to accommodate large-scale wind power projects. The key criteria to express the landscape sensitivity to wind power projects have been: scale, landform, degree of openness, land cover, degree of remoteness and wilderness, rarity and scenic quality, perception of change in the landscape, and inter-visibility with surrounding areas.

The criteria used to assess the sensitivity of landscape are shown in Table 6-7.

Table 6-7 Specific Criteria for Assessing the Landscape Sensitivity

Sensitivity of Landscape	Criteria Adopted by the Impact Assessment
High	A landscape in good condition, predominantly intact and with a clearly apparent distinctive character. Landscapes susceptible to relatively small changes.
Medium	A landscape in moderate condition, reasonable intact, retaining a distinctive character. Landscapes reasonably tolerant of changes.
Low	A landscape in poor condition, with poor integrity, where landscape character has been adversely affected. Landscapes potentially tolerant of substantial change.
Negligible	A heavily degraded landscape in damaged condition, lacking any integrity.

The sensitivity of visual receptors is defined as High, Medium, Low or Negligible based on professional interpretation of the value attached to the views experienced by people in the Study Area. Views from residential properties are typically considered to be highly valued. Views from roads are considered to be of medium to low value given that people's attention is primarily focused on the road. People involved in recreational activity (trekking, cycling) are considered to be medium sensitive receptors. People who work in the area are considered to be low sensitive receptors, given that their main interest is related to their occupation or activity.

6.3.5.8 Magnitude and Significance of Effects

The magnitude of change to the landscape character arising from the proposed WPP is defined as High, Medium, Low or Negligible (Table 6-8). It is based interpretation of a combination of parameters: the extent and proportion of existing landscape elements that would be lost, the geographic area over which the loss of landscape elements would be perceived, the degree to which the perceived value of the landscape would be changed, duration of the change and the reversibility of the change.

Table 6-8 Specific Criteria for Assessing the Extent and Magnitude of Impact on Landscape Character

Extent and Magnitude of Impact on Landscape Character	Criteria Adopted by the Impact Assessment
High	Total loss or major alteration to key landscape features such that the landscape character will be fundamentally changed.
Medium	Partial loss or alteration to one or more key landscape features such that the landscape character will be partially changed;
Low	Minor loss or alteration to one or more key landscape features such that the change/loss will be perceptible but the underlying landscape character or composition of the view will be similar to the baseline.
Negligible	Very minor loss or alteration to one or more key landscape features. Change will be barely distinguishable.

The magnitude of change to visual receptors is described as High, Medium, Low or Negligible (see

Table 6-9, below). It is based on interpretation of the following factors: the distance to the proposed windfarm, the duration of the predicted impact, the context in which the proposed windfarm would be seen, and the proportion of the affected view.

Table 6-9 Specific Criteria for Assessing the Extent and Magnitude of Visual Impact

Extent and Magnitude of Visual Impact	Criteria Adopted by the Impact Assessment
High	The Project would become a prominent and very detracting feature and would result in a very noticeable deterioration to an existing highly valued and well composed view.
Medium	The Project would introduce some detracting features to an existing highly valued and well composed view or would be prominent within a pleasing or less well composed view, resulting in a noticeable deterioration of the view.
Low	The Project would form a perceptible but not detracting feature within a pleasing or valued view or would be a more prominent feature within a poorly composed view of limited value, resulting in a small deterioration to the existing view.
Negligible	The Project would form a barely perceptible feature within the existing view and would not result in any discernible deterioration to the view.

The significance of any identified landscape or visual effect has been determined by correlating the magnitude of the effect (high, medium, low, negligible) with the sensitivity of receptor (high, medium, low, negligible). The effect significance is assessed as Major, Moderate, Minor or Negligible with the inter-categories of Major-Moderate, Moderate-Minor, and Minor-Negligible.

For the purposes of this assessment impacts of moderate adverse and above are considered to be significant in terms of ESIA.

6.3.6 Shadow Flicker

The methodology of the shadow flicker assessment included the following: a desk-based assessment to identify the potential receptors neighbouring the proposed Čibuk 2 WPP, modelling of the potential level of shadow flicker from the turbines, a site survey to inspect occupancy and condition of the affected receptors, and evaluation of predicted levels and their significance. The Study Area shadow flicker has been set at ten rotor diameters, i.e. 1,600m. The rationale for the shadow flicker Study Area is described in Section 6.2.3.

6.3.6.1 Identification of Potential Receptors

A geoprocessing ArcGIS buffer tool was used to calculate the extent of the Study Area of 1,600m. All structures identified within the Study Area have been considered to be potential receptors. Prior to the site visit, receptors' positions have been determined by using the national GIS database GeoSrbija (https://a3.geosrbija.rs).

6.3.6.2 Shadow Flicker Modelling Scenarios

The shadow flicker modelling was carried out using the commercial WindPro 3.6 software. The WindPro model is based upon a Zone of Theoretical Visibility (ZTV) analysis, which in this case was based upon a Digital Terrain Model (DTM) of 10m resolution. The model accounted for a set of conservative assumptions that simplified the real conditions in order to calculate the maximum risk of shadow impact. The calculation was undertaken for the worst case (astronomical) scenario.

The worst-case scenario represents the astronomical maximum shadow, a theoretical maximum assuming a number of simplifications:

- The sunshine is always of sufficient intensity to cause flicker;
- The wind turbines are in constant operation;
- The prevailing wind direction is always perpendicular to the turbine rotor to cast a sufficient shadow towards the receptor; more than 20% of the sun is always covered by the blade;
- All receptors have windows oriented in every direction ("greenhouses"). All windows have been assumed to measure 1m by 1m, actual house dimensions have not been taken into consideration;
- There are no trees, shrubs, blinds or other features to obscure the view of the turbines and block any potential shadow flicker.

The input parameters used in the model included the proposed WTG positions, turbine dimensions (GE Cypress 6.1-158), and receptors' positions.

Based upon calculations of the potential shadow impact at a given location, a shadow flicker map was created by rendering the isolines of the shadow impact.

6.3.6.3 Site Survey

A site survey was conducted in early November 2022 in order to inspect occupancy and condition of the structures predicted to be affected. The structures were classified in the following categories: (1) permanently occupied residential house, (2) periodically occupied residential house (in Serbian: weekend house), (3) abandoned house, (4) non-residential structure (industrial facility, barn or storage), (5) dilapidated structure, (6) derelict structure. More details about the categorisation are provided in Section 6.3.12 - Description of Structures and Buildings.

The presence and position of obscuring features and vegetation screening were checked around the houses, as well as the positioning and size of windows and doors and presence of blades and shades.

6.3.6.4 Evaluation of Effects and Significance Criteria

At the time of writing there is no legal limit in Serbia for shadow flicker to be identified as a significant effect. The IFC Guidelines and international best practice recommend that the duration of shadow flicker experienced at a sensitive receptor do not exceed 30 hours per year and 30 minutes per day on the worst affected day, based on a worst-case scenario.

Significance of impact is typically defined as a function of the sensitivity of a receptor and the magnitude of expected change. In this case, the sensitivity of shadow receptors depends on their use (residential / non-residential) and the level of occupancy (unoccupied / periodically occupied / permanently occupied). The sensitivity of receptor has been assessed by using the professional judgement on a scale of High, Medium, Low or Negligible.

Within this assessment, permanently occupied residential properties are considered to be highly sensitive receptors. Periodically occupied weekend houses are considered to be medium sensitive. Structures used by people who work (industrial structures) are considered to be low sensitive. Agricultural buildings sensitivity is considered to be low to negligible.

Once the worst-case shadow flicker effect has been modelled, if a receptor is predicted to exceed the thresholds, and its sensitivity is considered to be high or medium, then the shadow flicker effect is considered significant. Any shadow flicker effect on a low-sensitive receptor or below the threshold is not considered to be significant.

The resulting (adverse) impact significance is assessed as significant or not significant.

Mitigation have been proposed to minimise or remove predicted effects, if levels of shadow flicker have been deemed to be significant.

6.3.7 Climate Change Risk

In accordance with the EU Commission Technical Guidance on the Climate Proofing of Infrastructure in the Period 2021-2027 (July 2021) the following qualitative method has been used to determine the level of risk associated with current and future climate change impacts to the Project:

Risk = Likelihood of impact (occurrence) x Severity (consequence of impact);

Both likelihood and potential severity of impacts have been rated based on uniform scales. The likelihood scale has been adapted from the IPCC's guidance and consistent treatment of uncertainty. Scores have been determined based on a combination of available evidence and literature and professional judgement. The definitions of impact likelihood and severity are presented in

Table 6-10.

Table 6-10 Definition of Likelihood and Severity of Climate Change Impact

Impact Likelihood	Impact Severity to the Project
Very Likely: The event is almost certain. It occurred in the past and is very likely to occur again, according to available climate projections.	**Catastrophic:** The event can completely disrupt the Project activities, with long-term operational and commercial consequences.
Likely: The event is likely to occur following the current trend or climate projections.	**Major:** The event can have a high operational or commercial impact with potential significant consequences on assets, safety and health, engineering, reputation.
Moderate: The event is as likely to occur as not. It may occur according to available projections, but depending on the development of other linked phenomena, that might be more or less likely to occur.	**Moderate:** The event can have an operational impact without significant commercial impact. Requires additional emergency actions.
Unlikely: The event is unlikely to occur.	**Minor:** The event can have limited consequences on Project operation without commercial impact. Requires usual remedial actions.
Rare: The event is highly unlikely to occur.	**Insignificant:** 'Business as usual' for the Project.

The overall risk level obtained by combining the likelihood and severity of the impact is illustrated in the risk matrix presented in Table 6-11.

Table 6-11 Definition of Climate Change Risk Level Based on Impact Likelihood and Severity

		SEVERITY				
		Catastrophic	**Major**	**Moderate**	**Minor**	**Insignificant**
LIKELIHOOD	**Very Likely**	Extreme	Extreme	High	Medium	Medium
	Likely	Extreme	High	High	Medium	Low
	Moderate	Extreme	High	Medium	Low	Low
	Unlikely	Medium	Medium	Medium	Low	Low
	Rare	Medium	Low	Low	Low	Low

6.3.8 Archaeology and Cultural Heritage

A desktop assessment has been completed based on the preliminarily data provided by the statutory consultee - the Institute for Cultural Heritage from Pančevo. Mitigation and management measures have been proposed to ensure that the Institute's requirements are properly implemented.

6.3.9 Community Health and Safety

A qualitative risk assessment concerning the potential risks to the general public and workers associated with the construction, operation and decommissioning of the windfarm.

6.3.10 Traffic and Transport

The Traffic and Transport Study Area (see Section 6.2.4) has included the public road network around the development site that will be used for delivery of the construction materials as well as the roads that would be used for delivery of large WTG components.

A desk-based assessment has been carried out to:

- establish the baseline traffic conditions along the route,
- estimate the traffic levels likely to be generated during the construction phase,

- conduct qualitative assessment of potential impacts, and
- propose control and mitigation measures.

Baseline annual traffic flow data have been extracted from the annual traffic count database published a state road management company 'Roads of Serbia'. Baseline data on traffic accidents has been extracted from the annual reports published by the Ministry of Interior and the Agency for Traffic Safety.

There is no Serbian guidance on the environmental assessment of road traffic. This assessment has taken into account the Guidelines for the Assessment of Road Traffic (IEMA, 1993) which suggest two broad rules to be used to determine the extent of the impact assessment, i.e. the road links that will be included in the assessment. The rules are:

- Rule 1 - Include any road links where traffic flows would increase by more than 30% or the number of Heavy Goods Vehicles (HGVs) would increase by more than 30%; and
- Rule 2 - Include any other specifically sensitive areas where traffic flows would increase by 10% or more.

The sensitivity of roads, their users, and settlements along the proposed route, has been assessed in accordance with UK IEMA Guidelines as set out in Table 6-12. Sensitive receptors include hospitals, places of worship, schools, and historic buildings.

Table 6-12 Specific Criteria for Assessing the Sensitivity of Transport and Traffic Receptors

Sensitivity of Receptor	Criteria Adopted by the Impact Assessment
High	Settlements bisected by class I or class II state roads. Traffic management measures in place (such as controlled crossings and signalled junctions). Minor rural roads not constructed to accommodate HGVs. Will include unclassified unpaved roads with low traffic flow.
Medium	Roads constructed to accommodate HGVs in urban and residential areas with developed public facilities and services. Traffic management measures in place (speed limit, crossings, prohibited overtaking). Local road (paved or unpaved) suitable for HGV traffic and abnormal loads.
Low	Small rural setting with limited public services. Roads constructed to accommodate HGVs, class II state roads out of settlements. Minimal traffic management measures are in place. Paved road suitable for large volumes of HGV traffic and abnormal loads.
Negligible	Scattered dwellings with no local amenities. Motorways and class I state roads suitable for all types of vehicles and volumes. Outside settlements and no traffic management measures in place. Dirt roads in uninhabited areas.

The assessment is based on the use of a number of different types of vehicles used during the construction and operation of the Project. These include:

- Light Goods Vehicles (LGVs) – contractors' vans, minibuses, private cars etc.;
- Heavy Goods Vehicles (HGVs) – vehicles with a maximum rigid length of 12m and a maximum articulated length of 16.5m;
- Abnormal loads – vehicles over 25m in length or 3.6m wide.

Criteria for assessing the magnitude of change for road transport is listed in

Table 6-13.

Table 6-13 Specific Criteria for Assessing the Magnitude of Change for Road Transport

Magnitude of Change due to Traffic Impact	Increase in Traffic Flow	Increase in HGVs
High	Above 90%	Above 90%
Medium	Between 60% and 90%	Between 60% and 90%
Low	Between 30% and 60%	Between 30% and 60%
Negligible	Under 30%	Under 30%

The significance of identified transport and traffic effects has been determined by correlating the magnitude of the effect (high, medium, low, negligible) with the sensitivity of receptor (high, medium, low, negligible). The effect significance is assessed as Major, Moderate, Minor or Negligible with the inter-categories of Major-Moderate, Moderate-Minor, and Minor-Negligible.

For the purposes of this assessment impacts of moderate adverse and above are considered to be significant in terms of ESIA.

6.3.11 Radio Communication and Aviation

A qualitative risk assessment concerning the potential obstructions and interference during the operation of the WPP. The Study on Impact on Weather Radar has been referenced within the assessment.

6.3.12 Description of Structures and Buildings

The assessment of the impact of a project on people, often referred to as "sensitive receptors", is a central part of any ESIA. Within the context of a WPP, the technical specialists are particularly concerned about the impact of noise and shadow flicker. The initial site surveys, using satellite images and then visual inspection, will identify all of the structures within or close to the WPP that may be occupied by people. The design, location and condition of these structures is determined by their intended use.

For domestic properties, the general terminology of "farm building" or "summer house" is quite crude and can lead to confusion. It is also important to recognise that a derelict structure that cannot be occupied or used by people, will be very attractive to bats and other species. Within this ESIA, the authors have used four basic categories of structure, i.e., Residential House, Weekend House, Barn or Storage Shed, and Industrial Structure. In addition, each category has been given secondary descriptive words for the condition of the structure, i.e. In-use, Dilapidated and Derelict.

The basic categories of residential, domestic building adopted in this ESIA report are:

- Residential House: domestic building intended for permanent use; has facilities for cooking and has sleeping accommodation.
- Weekend House: periodically occupied, small domestic house or cabin that is occupied for only part of the year, seasonally occupied; has facilities for cooking and has sleeping accommodation.
- Barn: non-residential, medium to large agricultural building used for storing agricultural equipment (including tractors, ploughs etc.); used for housing livestock; used for storage of hay; not for habitation.
- Storage shed: non-residential, small building used for storing horticultural/ gardening tools (e.g. small power tools or hand tools); may be used for shelter during the day but has no formal sleeping accommodation.
- Industrial Structure: non-residential structure used by people who work (e.g. warehouse, petrol station, manufacturing plant, etc.).

The sub-categories that describe the condition of the building are:

- In-use: in good condition and is being used for its' primary purpose.
- Abandoned: in good condition and not currently in use.
- Dilapidated: not in use; a sound structure but only usable after repair (this could include repairs to broken windows and doors as well as minor roof repairs).
- Derelict: not in use; in a state of significant disrepair such as a collapsed roof, lack of doors and windows, collapsed walls. Probably easier and cheaper to knock down rather than repair.

It is noted that commercial buildings have been given an individual descriptive name, e.g. restaurant, hotel, garage, timber mill, etc as well as the sub-categories for their condition.

7 Environmental Setting – Natural Geography

7.1 The Physical Environment

The site of the proposed Čibuk 2 WPP is situated in a wide undulating plain of South Banat in Vojvodina Province in North-Eastern Serbia. It is a rural, predominantly agricultural region. The site is located about 40km east of the capital Belgrade (Figure 7-1).

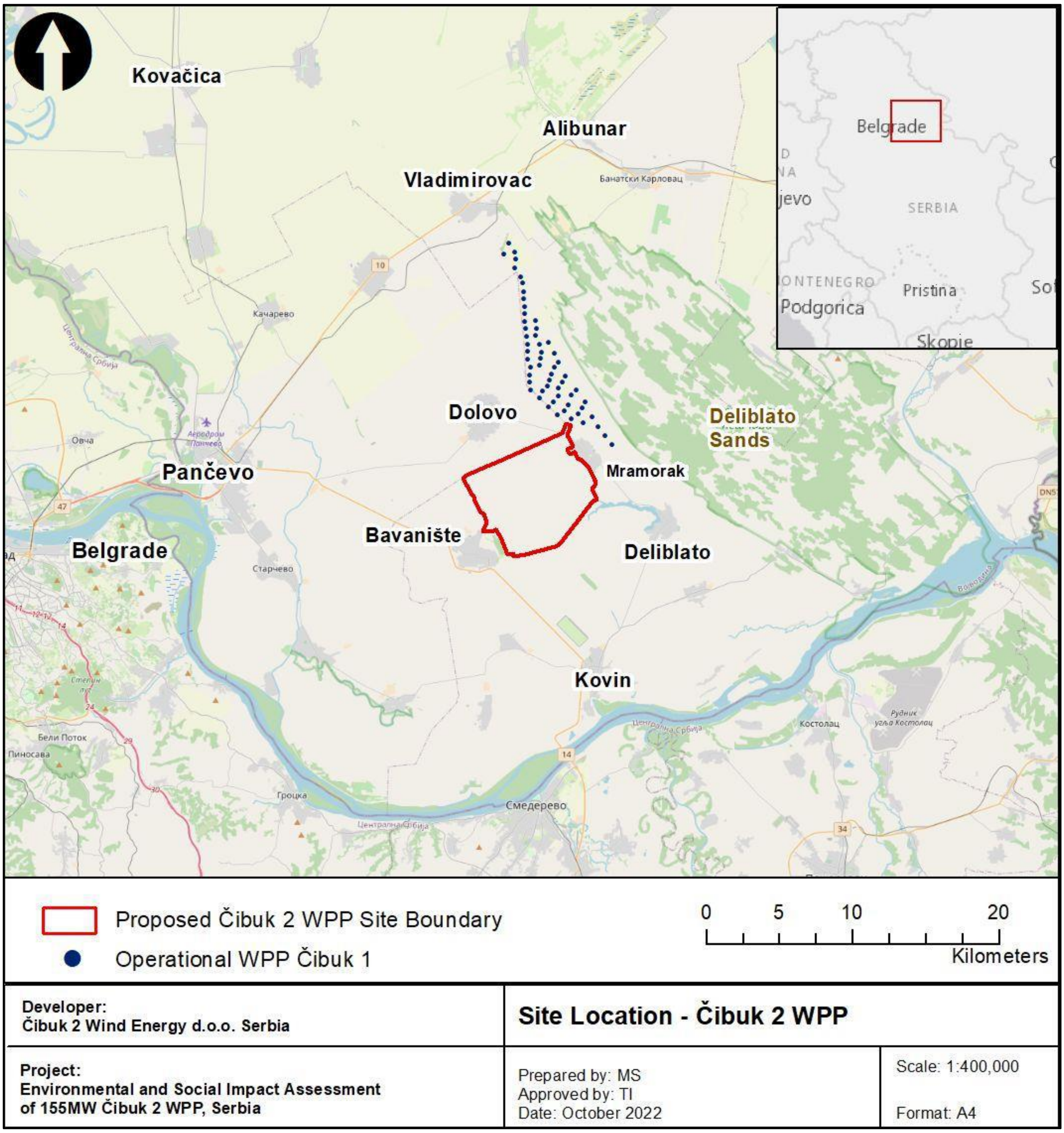

Figure 7-1 Site Location

7.1.1 Surrounding Area

The development site lies between three small villages: Bavanište, Dolovo, and Mramorak. The area is largely agricultural with limited industrial activity.

Since 1978, the Serbian oil and gas producer “NIS” (owned by “Gazprom Neft”) has been operating the small natural gas field “Mramorak Village” comprising 3 gas wells situated in the eastern portion of the site. Each well is more than 700m away from the nearest proposed WTG. NIS hold the oil and gas exploration licence for the area including the WPP site, i.e. exploration activities are allowed within the entire WPP site.

The site surrounding area is shown on Figure 7-3.

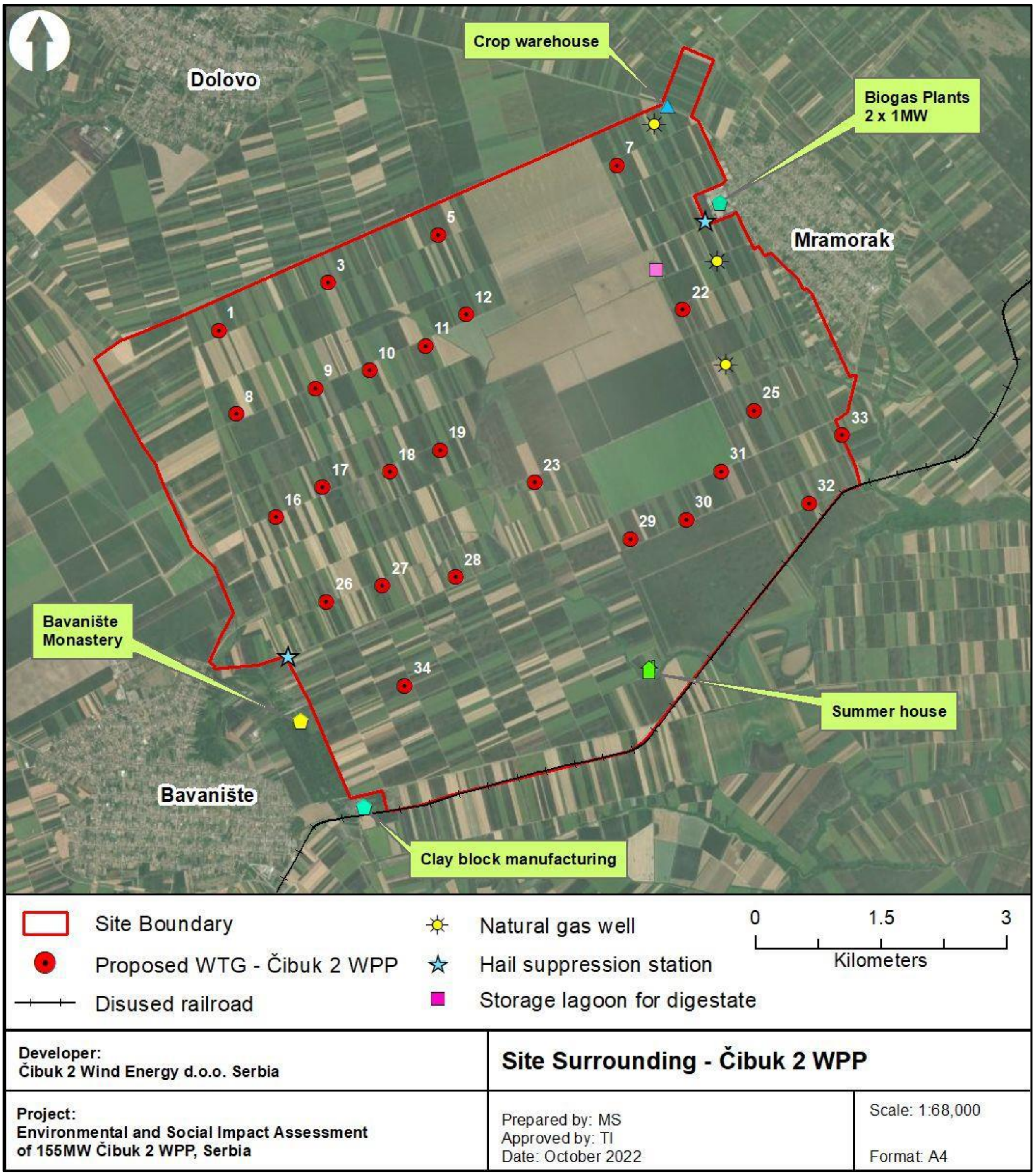

Figure 7-2 Area Surrounding the Site

There are two small biogas plants (1MW each) just north-east of the development site (Figure 7-3). A lined lagoon, used for storage of pumped liquid digestate from the biogas facilities is situated within the site, c. 500m north of the proposed WTG 22. The lagoon was built in 2020 by ‘Zlatar’ agricultural company. It is 164m long and 67m wide with the storage capacity of 11,500m^3. The digestate is spread on nearby cultivated fields.

Figure 7-3 Biogas plants in Mramorak

A small corn warehouse is present in the north-eastern portion of the site (Figure 7-4). A brick (clay block) production facility is situated just south-west of the site.

Figure 7-4 Crop Warehouse in the North-Eastern Portion of the Site

Two small hail suppression stations operated by the national meteorological service (RHMI) are situated within the site. During the preparation of the Zoning Plan, RHMI required a setback of at least 500m between the hail suppression stations and nearest WTGs.

The state road traverses south of the site, municipal roads travel north, east and south of the site. Numerous rough tracks also cross the site and they provide access to the farm plots. These tracks are not surfaced and during the winter months and following rain are often impassable to anything but farm vehicles. A disused railroad passes along the site's southern and south-western boundary.

The site is crossed by two 400kV power transmission lines (E-W and SW - NW directions).

7.1.2 Topography

The site is generally flat, gently sloping downwards from east and west (ca. 100m a.s.l.) to centre (ca. 90m a.s.l.). Only along the north boundary the slope is relatively steep (from 110 to 100m a.s.l.). The north-eastern corner of the site lies at the highest elevation of about 120m a.s.l dropping to about 82m a.s.l. in a small depression in the south-western part. The proposed WTG positions are at elevations in the range from 115.4m a.s.l. (WTG 7) to 92.3m a.s.l. (WTG 28).

To illustrate the low topographical variation in the area, a digital terrain model is presented in Figure 7-5.

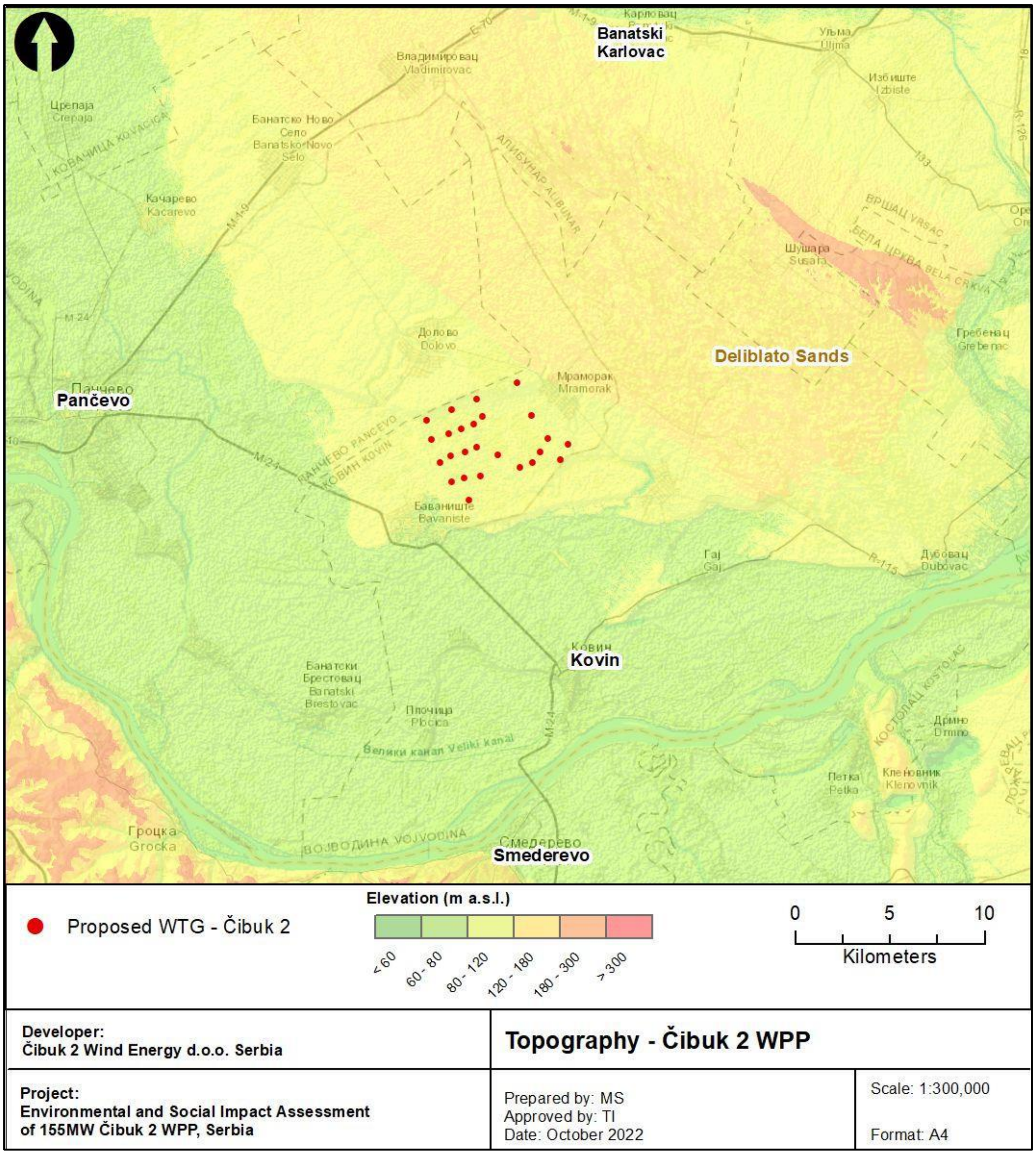

Figure 7-5 Elevation Map of the Area

7.1.3 Geology

The development site lies in the southern part of the Pannonian Plain, a flat lowland formed after an inland sea (the Pannonian Sea) dried up during the Pliocene Epoch.

The site lies at the South Banat loess plateau, flat to gently rolling lowland extending between floodplains of the Danube and Tamiš rivers. It is a large wind-blown relief formed by the accumulation of loess – a silt aeolian (windborne) sediment, deposited on floodplains, entrained by the wind. Uncovered subsurface loess deposits observed in the area of the Kraljevac Reservoir are shown on Figure 7-6.

Figure 7-6 Uncovered Subsurface Loess Deposits South-East of the Site

The subsurface Quaternary layer is composed of loess (approximately 20-25m thickness) and is underlined by alluvial marshy deposits consisting of clay, silt and silty sand (approximately 50-60m thickness). Below the Quaternary layer is the Pliocene bedrock comprising clay deposits (several hundreds of meters thickness) which alternate with sand strata.

7.1.4 Hydrogeology

A conceptual hydrogeological model of the WPP site has been developed based on the geotechnical investigation conducted between October 2021 and March 2022, publicly available information on the current water supply in the area and the Basic Geological Map of Serbia.[11,12,13]

The conceptual hydrogeological model is presented on Figure 7-7, illustrating the lithological conditions at the site. The distance to public groundwater wells in Bavanište and Mramorak is not exact and is for illustration purposes only.

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[11] Geokonsult d.o.o. (April 2022) – Geotechnical Elaborate for the WPP Čibuk 2.
[12] Kovin Municipality Development Plan 2022 – 2028 – An overview and analysis of the current state of infrastructure and environmental protection; Municipality of Kovin, 2021; http://www.kovin.rs/planovi-i-pravilnici/
[13] Basic Geological Map of Serbia 1:100,000 https://geoliss.mre.gov.rs/OGK/RasterSrbija/

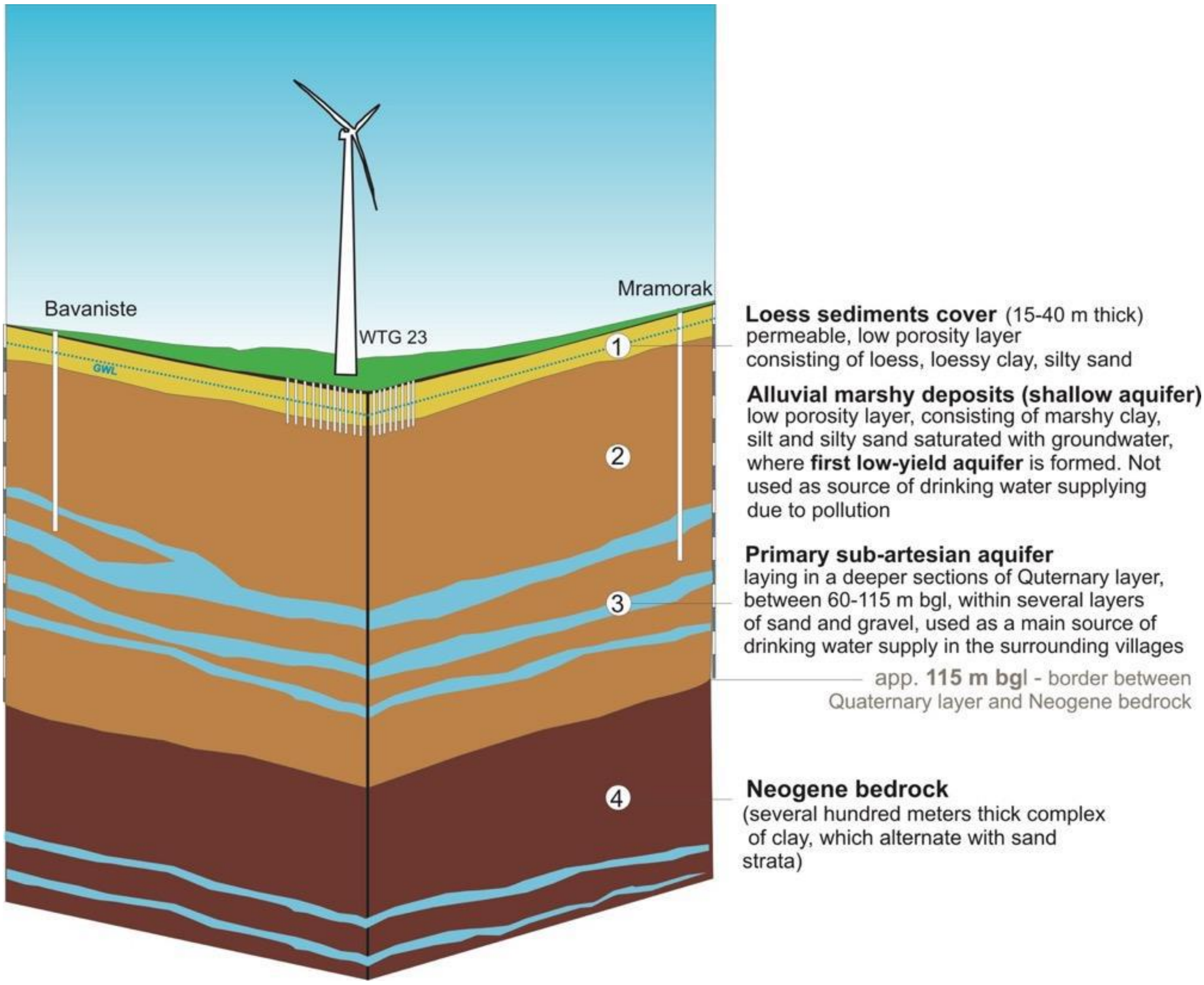

Figure 7-7 Conceptual Hydrogeological Model of the Development Site

From the surface downward, the following basic lithological units have been distinguished:

- Humus layer – up to 0.4m thick;
- Loess sediment cover layer - consisting of loess, loessy clay and silty sands. Across the majority of the site, the loess sediments have thickness of about 20 to 25m, however the thickness varies from 14.6m b.g.l. at the location of the WTG No. 23 to more than 40m b.g.l. at the locations of the WTGs No. 5, 7 and 34. This layer has a large portion of clay, small porosity and provides a semi-permeable barrier to contaminant transport to deeper layers;
- Alluvial marshy deposits – consisting of marshy clay, silt and silty sands. This layer is saturated with groundwater and its thickness vary from 60 to 100 m. The upper loess and other alluvial deposits are porous, providing conditions for a low-yield shallow aquifer to form within the alluvial silty sands.
- During the geotechnical investigation, the groundwater level at the site was determined at a depth between 6.6 and 10.6m b.g.l. and it varies during the year, depending on hydrological conditions. In the wider regional area this shallow aquifer is of a generally poor quality, including microbiological pollution. This is typical for Vojvodina Province and is a result of naturally high background values of heavy metals, lack of treatment of domestic wastewater from settlements and uncontrolled use of agricultural chemicals. The shallow aquifer is not used for drinking water supply;
- Sub-artesian aquifer is formed within deeper sections of Quaternary sediments (at a depth between 60-115m b.g.l.) consisting of several layers of sand and sandy gravel. This is a major aquifer for

drinking water supply in the surrounding villages (Mramorak, Bavaniste, Deliblato) as well as in the wider area of Vojvodina Province, called ‘the major water-bearing layer’.

- Neogene bedrock. The Quaternary layer is underlined by several hundred meters thick Neogene complex consisting of thick non-permeable clay deposits which alternate with sand strata.

Public water supply of villages surrounding the WPP site is organised separately – each village has its own water mains.

- Mramorak operates two groundwater wells (117 and 126m deep) which are situated in the north-eastern outskirts of the village, more than 2km away from the closest proposed WTGs (7 and 22). Mramorak lacks an adequate drinking water treatment facility and iron, manganese and ammonium levels regularly exceed the drinking water quality standard.
- Bavanište operates one groundwater well (75m deep) which is situated in the southern outskirts of the village, more than 3km away from the closest WTG 34. Since 2017 the village has an adequate water treatment facility and the drinking water quality is in accordance with the standard.
- Dolovo is supplied with potable water from the water mains in Pančevo;

The development site is not located in groundwater protection areas of Bavanište and Mramorak. Given the organised water supply in the villages, the presence of private water supplies in the site surrounding is not considered likely.

The groundwater resource sensitivity at the site is considered to be low. The shallow aquifer is exposed to surface contamination, however due to low yield and poor quality it is not used for potable purposes in the region. The primary deep aquifer is covered by low-permeable deposits which limit exposure to pollution.

7.1.5 Surface Water and Drainage

The development site is intersected by small natural and man-made drainage canals, part of the ‘Crna Bara’ local drainage system. The canals are also connected to the nearby Kraljevac Bog, designated as Special Nature Reserve, just beyond the south-eastern site boundary. During the low flow periods, the canals are dry (Figure 7-8).

Figure 7-8 Dry Drainage Canal at the WPP Site in July 2021

The largest perennial water body in the area is the reservoir Kraljevac, 3km south-east of the WPP site (Figure 7-9). The reservoir area is ca. 160 hectares. The reservoir was formed in 1983 when a small dam was built in the village of Deliblato and streams running from Deliblato Sands filled the reservoir. A bog formed around the reservoir is connected to the drainage canals at the WPP site.

Figure 7-9 The Kraljevac Reservoir South-East of the Site

The hydrology at the development site is shown on Figure 7-10.

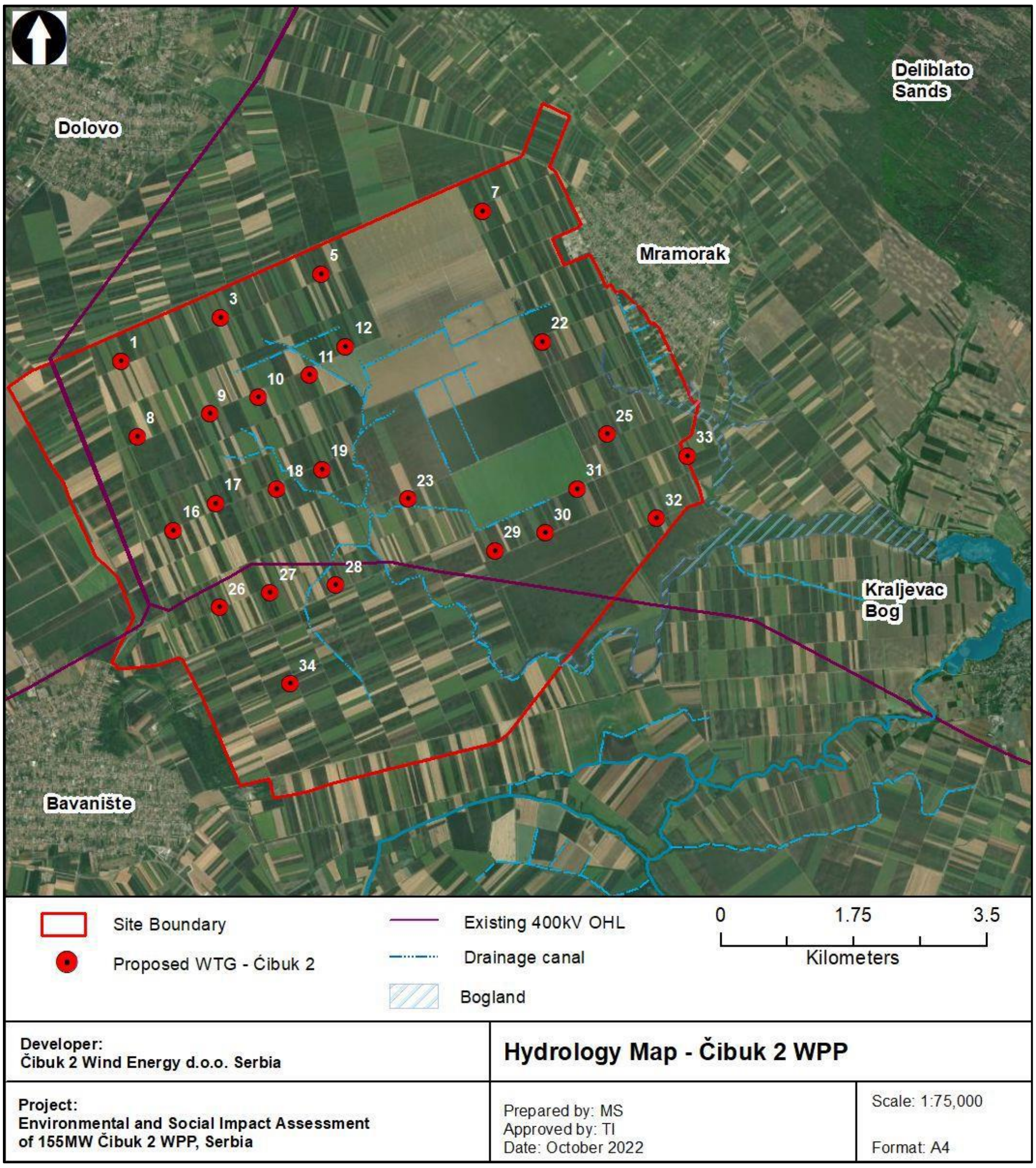

Figure 7-10 Hydrology at the Čibuk 2 WPP Site

The Kraljevac Reservoir is directly affected by domestic wastewater effluent from the village of Deliblato which has no sewer system and relies on septic tanks of questionable integrity and efficiency. The water quality of drainage canals in the area is affected by untreated domestic wastewater from villages, untreated wastewater from nearby farms and the uncontrolled use of agricultural chemicals.[14]

With regard to surface water resources, the WPP site is considered to be located in a low sensitivity setting. The sensitivity of the canals with respect to their drainage properties is considered to be low. With respect to water quality, the canal sensitivity is low.

7.1.6 Soil Quality

The development site presents an association of black soils (Chernozem) which are rich in carbonates and productive. The humus layer at the site was determined to be up to 0.4m below ground. [15]

The storage lagoon for digestate was built in 2020. Information available in the public domain indicate that the lagoon is fitted with the HDPE bottom liner and equipped with a leak detection system.

The site has been under agricultural cultivation for decades. Due to the common practice of uncontrolled application of agricultural chemicals in Vojvodina, soil contamination by fertilisers is possible.

Considering its agricultural use the soil receptor sensitivity is assessed to be medium.

7.1.7 Climate Setting

The site area has a moderate continental climate, with notable central-European and Mediterranean influences, characterised by variable seasons and higher temperatures in the autumn than the spring.

The temperature fluctuations between the seasons are significant and characterised by cold winters and hot summers. The average annual temperature is 11.3°C. The coldest month is January (-1.2°C), the warmest is July (21.4°C). The absolute temperature maximum recorded was 44°C, the absolute minimum was -32.6°C.[16]

The Banat Region is not prone to significant ice build-up. According to the Wind Power Icing Atlas, it is a Class 1 area, experiencing up to 7 days per annum of ice build-up conditions. [17]

Precipitation has a pronounced seasonality. The average annual rainfall (1981-2010) is 623mm. The highest rainfall is in late spring and early summer. Rainfall maximum reaches up to 85mm in June dropping to 35mm in February. The average humidity is 78%. The most humid month is December (85%), the least humid is April (71%).

The annual total sunshine duration is 2,182 hours. It is highest in July 6.03 hours per day), the lowest in December (1.1 hours per day).

The area of Kovin experiences around 35 days of lighting per annum. Lightning is most common in summer months. The annual number of hail events is between 10 and 15. The majority of hailstorms (85%) occur between May and July.

The analysis of the observed climate change is provided in Section 9.1.1 Observed Climate Change in South Banat.

7.2 Natural Hazards

7.2.1 Earthquake Hazard

Serbian technical standards for seismic design of buildings are in line with the European standard EN-1998 Eurocode 8: Design of Structures for Earthquake Resistance which sets two requirements:

- The structures shall be designed not to collapse during earthquake with a probability of exceedance of 10% in 50 years (this corresponds to 475 years return period);
- The structures shall be designed to withstand limited damage during earthquake with a probability of exceedance of 10% in 10 years (this corresponds to 90 years return period).

[14] The Special Nature Reserve Kraljevac (2019) - The Management Plan of the Kraljevac Special Nature reserve (2020-2029)
[15] Geokonsult d.o.o. (April 2022) – Geotechnical Elaborate for the WPP Čibuk 2.
[16] Data from the state meteorological station "Kovin" for the reference period 1981 to 2010.
[17] http://virtual.vtt.fi/virtual/wiceatla

An earthquake hazard map for the development site provided by the statutory stakeholder - Institute for Seismology of Serbia indicates that the macro seismic intensity for the return period of 475 years is VIII degrees of the European EMS-98 scale which refers to a heavily damaging earthquake.

Under Serbian regulations, WPP design has to be in compliance with technical standards for construction of high-rise buildings in earthquake areas.[18] The respective regulation classifies high-rise buildings into four categories, depending on the severity of potential earthquake damage. The zero category (or "out of category") buildings relate to nuclear power plants, buildings with more than 25 storeys, storages of flammable or toxic substances, etc. WPPs are in the category below ("1st category"), i.e. buildings whose seismic design requirements must be based on site-specific risk analysis (i.e. seismic micro-zonation).

The seismic micro-zonation at each of proposed 25 turbine locations was carried out in spring 2022.[19] The results will be used as seismic requirements for the detailed design.

7.2.2 Other Hazards

The area is predominantly flat and it does not experience water erosion. Wind erosion is present although mitigated by vegetation cover. According to the Preliminary Flood Risk Assessment of Serbia (2019) the development site is not situated in an area of flood risk.

The geotechnical investigation report concluded that there are no active landslide risk areas or other visible terrain instabilities identified at the site.

7.3 Ecology and Nature Conservation

7.3.1 Introduction

The site is located in the Pannonian province of the Pontic biogeographic region (Janković *et al.* 1984, Matvejev & Puncer 1989), i.e. Pannonian biogeographic region according to EEA (2016), that is characterised by natural forest-steppe vegetation. The historic, natural vegetation and ecosystems have become heavily fragmented and altered in the entire province by centuries of human activity, and these processes still take place (Janković *et al.* 1984, Stevanović & Stevanović 1995, Stevanović & Vasić 1995). Most of the Pannonian province is now dominated by agricultural habitats – mainly arable farmland in the South Banat region.

As a consequence, most of the province, and the Čibuk 2 WPP site itself, has limited ecological value.

7.3.2 Designated Sites

There are ***no designated sites*** within the WPP site boundaries (IfNCV 2021, IfNCS 2022, Figure 7-11). There are only several small generically protected fragments of woodland/scrub, marshland and wetland (Figure 7-18).

The AoI does include a number of Protected Areas and Areas of the Ecological Network of Serbia that are relevant to this assessment (Figure 7-11).

[18] Regulation on Technical Standards for Construction of High-rise Buildings in Seismic Areas (Off. Journal of RS, No. 31/81, 49/82, 29/83, 21/88, 2/90).
[19] Geokonsult d.o.o. (April 2022) – Geotechnical Elaborate for the WPP Čibuk 2.

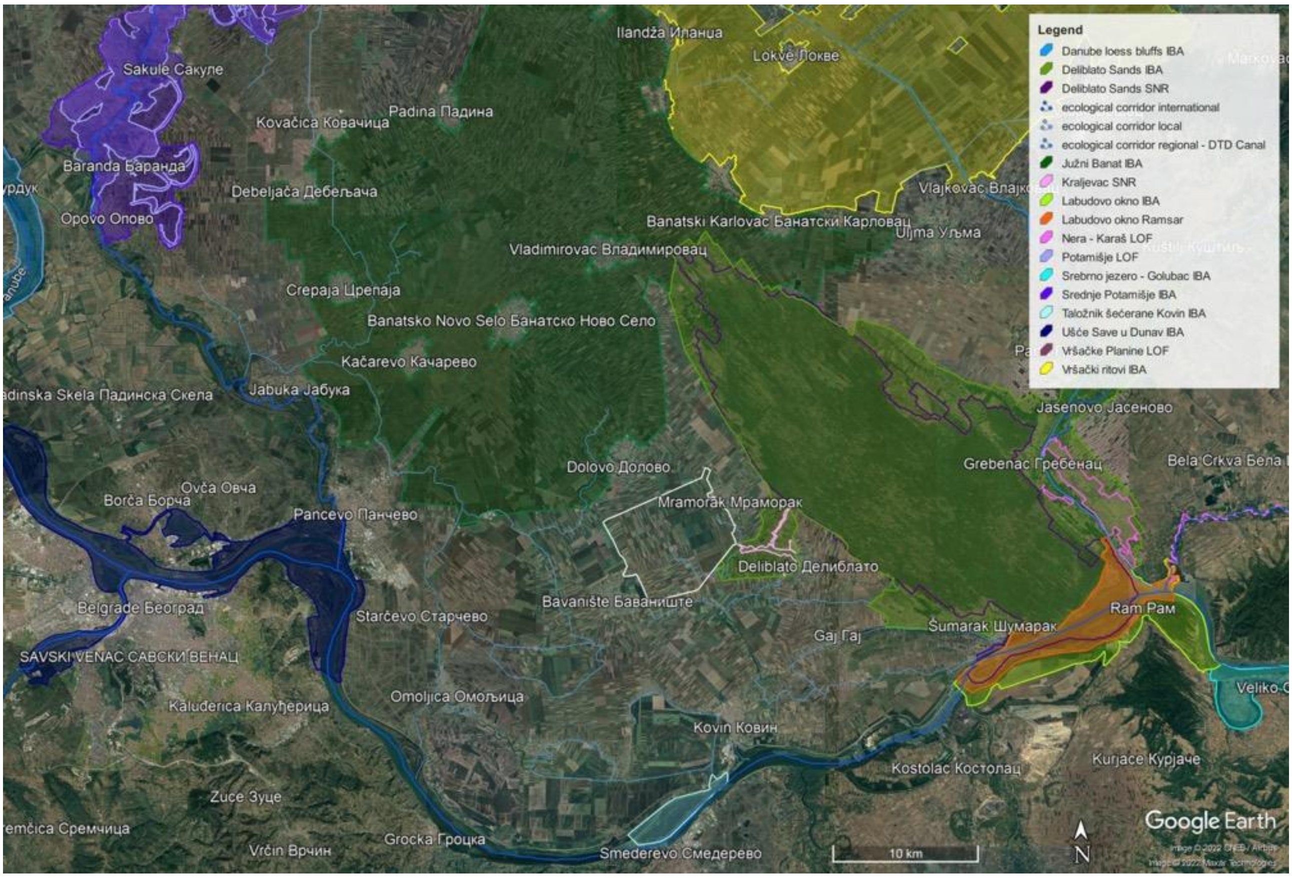

Figure 7-11 Location of the Čibuk 2 WPP Site in the South Banat Region and Potential AoI

The Čibuk 2 site is outlined in white

Source: Google Earth 2022, IfNCS 2022, BirdLife International 2022a, b, c, d, e, f, g, h, i, j, with modification by I. Karapandža, original

7.3.2.1 Internationally Protected Sites

7.3.2.1.1 Deliblatska Peščara – Deliblato Sands IBA

The largest area of preserved original forest-steppe vegetation in the entire Pannonian Plain is Deliblato Sands (IfNCV 1998), located to the east of the WPP site. This is "*the largest European area of aeolian sand deposits with pronounced features of the dune type relief and characteristic sand, steppe and forest ecosystems* (Figure 7-12), *with a unique mosaic of biocoenosis and typical and specific flora and fauna, . . . and one of the most important biodiversity hotspots in Serbia and Europe*" (Official Journal of RS, No. 3/2002, 81/2008). It is a recognised IBA – Deliblatska pescara (IBA code RS016) (BirdLife International 2022b), with 180 bird species registered thus far (Puzović *et al.* 2009). With 21 bat species recorded, this is also one of the bat diversity hotspots of Serbia, and the most important such hotspot in the Vojvodina Province (Paunović *et al.* 2020, Consultant's data).

The area of 34,829.32 ha is protected as a Category I Protected Area the Deliblatska peščara SNR (Official Journal of RS, No. 3/2002, 81/2008). The areas of Deliblato Sands SNR and IBA (48.758 ha) are not fully compatible (Figure 7-11). IBA covers a somewhat larger area beyond the SNR boundaries, including two smaller adjacent designated sites – Kraljevac SNR (section 7.3.2.1.2) and Nera - Karaš LOF (IfNCS 2022), whilst SNR, on the other hand, includes also large parts of another IBA – Labudovo okno (RS033) (BirdLife International 2022e). At the nearest point, the SNR boundary is at about 2.8 km from the site boundary and about 4.1 km from the closest WTGs, whilst the IBA, since it includes Kraljevac Bog, borders the WPP site and is at about 220 m from the closest WTGs.

For birds, this is primarily an important nesting and foraging area for a number of protected species (IfNCV 1998, Puzović *et al.* 2009). The IBA designation has been triggered by breeding populations of European Turtle Dove (*Streptopelia turtur*), Red-backed Shrike (*Lanius collurio*), Barred Warbler (*Curruca nisoria*) and European Nightjar (*Caprimulgus europaeus*) Species of global conservation concern that do not meet IBA criteria: White-tailed Eagle (*Haliaeetus albicilla*) (wintering), Eastern Imperial Eagle (*Aquila heliacal*) (breeding) and Corncrake (*Crex crex*) (breeding).

For bats, this is also a prime foraging and roosting habitat, though the ESIA has not found any indication that bats roosting in Deliblato Sands occur at the WPP site in any non-negligible number, and thus cannot be exposed to any significant impacts of the Project.

Figure 7-12 Rolling Aeolian Relief and Forest-steppe Habitats Typical of the Deliblato Sands SNR/IBA

7.3.2.1.2 Kraljevac Bog

Nearby to the southeast of the site is Kraljevac Bog (Bara Kraljevac), a wetland area that includes a reservoir formed from the abandoned meander of the former Kraljevac watercourse (Figure 7-9) and surrounding bogs (IfNCV 2005, Faculty of Mining and Geology 2012). Together with the localities Obzovik (valley created by river erosion) and Spasovina (pasture area on a loess terrace), Kraljevac Bog constitutes an integral ecological unit that includes a complex of grassland, marshland and aquatic habitats (IfNCV 2005). This entire area has been legally protected "*in order to preserve geomorphological, hydrological and biological values . . ., relict plant communities of Marsh Fern and Common Sallow . . ., European Ground Squirrel and Lesser Mole Rat, . . . floating islands of the (former) Kraljevac watercourse, and ponds that are a prime habitat for diverse fish community and migratory waterbird species, as well as nesting habitat for rare and threatened waterbird species, in particular: Great Crested Grebe, Ferruginous Duck, West Marsh Harrier, Whiskered Tern and Black Tern etc.*" (Official Journal of RS, No. 14/2009)

The area of 264.30 ha is legally protected as a Category I Protected Area the Kraljevac SNR (Official Journal of RS, No. 14/2009). The SNR with wider surrounding area is included in Deliblato Sands IBA and Area of the Ecological Network of Serbia (Figure 7-11, section 7.3.2.1.1). At the nearest point, the IBA borders the WPP site and is at about 220 m from the closest WTGs, whilst the SNR boundary is at about 70 m from the site boundary and about 650 m from the closest WTGs.

For birds, this is an important nesting, feeding and staging area for a great number of protected species, waterbirds in particular, and an important area for wintering waterfowl populations as "parts of the water surface do not freeze even in during the coldest winter periods". The surrounding loess faces are an important nesting area for European Bee-eater and Sand Martin, and grasslands are an important hunting areas for raptors and owls (IfNCV 2005). Kraljevac Bog is also an important foraging habitat for several bat species (Paunović *et al.* 2020, Consultant's data).

7.3.2.1.3 Južni Banat – South Banat IBA

In the vicinity of the WPP site, to the northwest and further to the north, is Juzni Banat IBA (RS058). It is designated in late 2020, after the latest regular revision of IBAs in Serbia undertaken in 2019-2020 (BirdLife International 2022d). It comprises a vast (76,381 ha) central part of the South Banat region (Figure 7-11). It is characterised by arable farmland with only sparse small patches of natural and semi-natural habitats within (Figure 7-13) and borders 18 settlements. Juzni Banat IBA is still not listed as an Area of the Ecological

Network of Serbia, due to recent designation, though all IBAs are generically considered as such (Official Journal of RS, No. 102/2010). At the nearest point, the IBA boundary is located at about 1.5 km from the WPP site boundary and about 2.3 km from the closest WTGs.

The IBA designation has been triggered by the breeding / resident populations of 5 species (Appendix C): breeding Common Kestrel (*Falco tinnunculus)*, Tawny Pipit (*Anthus campestris*), Great Short-toed Lark (C*alandrella brachydactyla*), Black-winged Stilt (*Himantopus himantopus*) and a significant number (6-8 breeding pairs) of globally threatened Saker Falcon (*Falco cherrug*).

Figure 7-13 Gently Rolling Configuration and Farmland Habitats Typical of the Juzni Banat IBA.

7.3.2.1.4 Danube River Valley

The WPP site is surrounded by the Danube River from the northwest to southeast at the distance between 55 and 12 km. The Danube River valley is an important European migration route (i.e. flyway) for both birds (BirdLife International & Wetlands International 2022) and bats (Paunović *et al.* 2011, 2020) and thus designated as an Ecological Corridor of International Importance and a part of the Ecological Network of Serbia (Official Journal of RS, No. 102/2010). Wetlands along the Danube river valley constitute several IBAs within the Project's potential AoI with regard to birds (Figure 7-11):

- Danube loess bluffs (RS010) (BirdLife International 2021a), also Global KBA (KBA Partnership 2020a), at the nearest point at about 42 km to the northwest from the WPP site;
- Confluence of the Sava and the Danube (RS040) (BirdLife International 2022i), also Global KBA (KBA Partnership 2020e), at about 17 km to the west;
- Kovin crushing plant (RS078) (BirdLife International 2022h) at about 12.5 km to the south;
- Swan zone (RS033) (BirdLife International 2022e) at about 18 km to the southeast;
- Silver Lake - Golubac (RS071) (BirdLife International 2022f) at about 34 km to the southeast.

The most valued of these is Labudovo Okno (Figure 7-14) – a complex of wetland habitats along the south margin of the Deliblato Sands, including the Danube river itself with its branches, lagoons, islets, floodplain and riverbanks (Puzović *et al.* 2006). This is "*an important gathering place of waterbirds, a breeding site of globally endangered species, a feeding area for numerous rare and endangered species and the most important staging site for waterbirds in Serbia*" (Puzović *et al.* 2006) "*regularly holding 60,000-100,000 individuals during winter and migration periods*" (BirdLife International 2022e). Most of this area (3,125 ha), excluding the right riverbank, is Protected Area included within the Deliblato Sands SNR (Official Journal of RS, No. 3/2002, 81/2008). The wider area (3,733.39), including the right riverbank, is a Wetland of International Importance, i.e. Ramsar Site (Puzović *et al.* 2006), whilst even wider (6,488 ha) is an IBA (Figure 7-11), Critical Site for Waterbirds (BirdLife International & Wetlands International 2022) and Global KBA (KBA Partnership 2022c).

The ESIA has not found any indication that individuals from populations of any of the IBAs located along the Danube river occur at the WPP site (including IBA-triggering species, see Appendix C). This means that these IBAs populations cannot be exposed to any significant impacts of the Project.

Wetlands and riparian habitats along the Danube river valley are also prime bat foraging and roosting habitats, with 18 bat species recorded thus far in the area of Belgrade alone (Paunović *et al.* 2020). However, this entire area is located at a distance greater than the maximum commuting distances (Rodrigues et al. 2015, Dietz et al. 2009) of all bat species (potentially) occurring at the WPP site, and thus beyond the Project AoI with regard to bats.

Figure 7-14 Labudovo Okno from the Banat (left) Bank of Danube River

7.3.2.1.5 Potamišje – Tamiš River Valley

From north to the west at the distance between 42 and 17 km the WPP site is surrounded by the floodplains of the Tamiš river (Figure 7-11). Tamiš river is one of the last remaining unregulated, wild rivers in Europe that regularly floods its vast alluvial plain (Tucakov 2011, IfNCV 2013). This is an area of preserved aquatic, wetland, marshland, grassland and woodland habitats (Figure 7-15) and a very high diversity of flora and fauna. The fauna of Potamišje includes 257 bird species recorded so far, 133 of which nesting, as well as 12 bat species recorded and further 8 considered potentially occurring.

Tamiš River Valley is currently in the procedure of revision of legal designation as a Category I Protected Area the Potamišje LOF (MoEP 2019), whilst a wider area is an Area of the Ecological Network of Serbia (Official Journal of RS, No. 102/2010). It comprises two IBAs: Gornje Potamisje (RS039) (BirdLife International 2022c), and Srednje Potamišje (RS014) (BirdLife International 2022g), also Regional KBAs (KBA Partnership 2020b, d). The area due to be protected (23,989.79 ha + 20,109.83 ha buffer zone = 44,099.62 ha) fully encompasses both IBAs (20,087 ha + 14,507 ha = 34,594 ha). Srednje Potamišje IBA is also recognised as a Critical Site for Waterbirds (BirdLife International & Wetlands International 2022). The Tamiš river itself, with its riparian belt, is also protected as an Ecological Corridor of International Importance and is a part of the Ecological Network of Serbia (Official Journal of RS, No. 102/2010). At the nearest point, the boundaries all designated areas is located at about 35 km from the WPP site boundary and from the closest WTGs.

Potamišje is an important nesting, wintering and foraging area for a number of protected waterbird species. However, the ESIA has not found any indication that individuals from these populations, including IBA-triggering species (Appendix C), potentially occur at the WPP site, and thus cannot be exposed to any significant Project impacts. This also a prime bat foraging and roosting habitat, and known migration route (Paunović *et al.* 2020). However, this entire area is located at a distance greater than the maximum commuting distances (Rodrigues et al. 2015, Dietz et al. 2009) of all bat species (potentially) occurring at the WPP site. This means that the Potamišje is beyond the Project AoI with regard to both birds and bats.

Figure 7-15 Tamiš River Near Pančevo.

7.3.2.1.6 Vršački ritovi – Vršac Marshes IBA

Vrsacki ritovi is another IBA (RS083) designated as recently as late 2020, after the latest revision of IBAs in Serbia (BirdLife International 2022j). It is located to the northeast of the WPP site and further to north and east (Figure 7-11). It comprises a vast (60,789 ha) area of the East Banat Depression – fluvio-palustrine bottom of the Pannonian Basin, the flattest and the lowest part of the South Banat region (Davidović *et al.* 2003, Faculty of Mining and Geology 2012). Within arable farmland predominant in the area, there are numerous patches of ponds, (saline) marshes, bogs, and meadows still preserved (BirdLife International 2022j). The area is traversed by the DTD Canal (Figure 7-11) and borders 20 settlements. Although Vrsacki ritovi IBA is still not listed as an Area of the Ecological Network of Serbia, due to recent designation, all IBAs are generically considered as such (Official Journal of RS, No. 102/2010). At the nearest point, the IBA boundary is located at about 18 km from the WPP site boundary.

This is an important wintering and breeding area of several protected bird species of farmland, grassland and wetland habitats. The IBA designation has been triggered by 2 wintering populations and 4 breeding/resident populations (Appendix C) most importantly, a significant number (3-4 breeding pairs) of globally threatened Saker Falcon (*Falco cherrug*). However, the ESIA has not found any indication that individuals from this IBA populations occur at the WPP site, i.e. that the Vrsacki ritovi IBA bird populations (including IBA-triggering) can be exposed to any significant Project impacts.

7.3.2.2 Nationally Important Areas

7.3.2.2.1 Danube-Tisa-Danube Canal

DTD Canal is a multifunctional hydro-engineering system constructed across the Vojvodina Province. The main DTD canal (Figure 7-11) is an Ecological Corridor of Regional Importance (IfNCV 2020) a thus a part of the Ecological Network of Serbia. It surrounds the WPP site from north to the southeast at the distance between 37 and 22 km.

Figure 7-16 DTD Canal Traverses Vršački ritovi IBA and Vojvodina Province

7.3.2.3 Woodland/scrub, marshland and wetland fragments

Within the site boundary there are several small woodland/scrub, marshland and wetland fragments (Figure 7-18) that are generically protected by the Law on Nature Protection (Official Journal of RS, No. 36/2009a, 88/2010, 91/2010 - *correction*, 14/2016, 71/2021): "*Conservation of biological and landscape diversity of habitats within agroecosystems . . . is primarily implemented through conservation and protection of marginal habitats, hedges, field boundaries, individual trees, groups of trees, ponds and meadows, as well as other ecosystems with preserved or partially altered woodland, scrub, grassland or wetland vegetation*" (Article 18, paragraph 6). Such patches of forest/scrub and other relatively preserved natural habitats within the vast lowland farmland areas are essential not only for conservation of biodiversity, birds (e.g. Aebischer *et al. eds.* 2000) and bats (e.g. Rehák *et al.* 2010, Fuentes-Montemayor *et al.* 2013) in particular, but also for the ecological stability of the entire agroecosystem (Stevanović & Vasić 1995).

7.3.2.4 Canals

Part of the irrigation system crossing the area, i.e. canalized rivers that flow into the Kraljevac bog (Figure 7-10), has been designated as Ecological Corridors of Local Importance and a part of the Ecological Network (Figure 7-11). Two branches of this system are partly located within the WPP site boundary – one in a length of about 4.3 km, extending from the central part of the site to the southeast, and the other in a length of about 1.8 km, along the east site margin. The nearest Čibuk 2 WTGs are located more than 500 m from these canals. Such canals are typical habitat features that most bat species use for commuting and foraging, and certain species of birds for nesting and feeding (which is elaborated in more detail in sections 7.3.4.1 and 0).

7.3.3 Habitats

7.3.3.1 General Description

The entire WPP site comprises intensively managed arable farmland with very scarce elements of semi-natural habitats (Figure 7-17), including small areas of marshland, woodland and scrub, as well as small areas of different artificial habitat types. Therefore, the overall habitat diversity and ecological value, as well as bird and bat interest, of the area are low. However, it is noted that all fragments of semi-natural vegetation are legally protected because of their importance for the conservation of biodiversity within otherwise vast farmland area (as elaborated in section 7.3.2.1).

The **farmland** of the type Intensive unmixed crops (EUNIS code I1.1 / national code G1.1) is by far the most dominant habitat across the survey area, covering about 96.86% of the site area.

The Road network (J4.2 / H8.22) crosses the site and covers 0.96% of the site area. These are rough tracks, mostly unpaved, allowing access to the fields for farming.

The site is also crossed by a network of irrigation canals that belong to the Highly artificial non-saline running waters habitat type (J5.4 / H9.5), covering 0.55% of the site area.

Figure 7-17 The WPP site Comprises Arable Farmland with Sparse Elements of Any Semi-natural Vegetation

The most widespread type of **woodland** within the site is Orchards (G1.D4 / B7.22), which covers 0.31% of the site area. Both semi-natural types of woodland together are less represented: *Robinia* plantations (G1.C3 / AA.12E) – 0.13%, Lines of trees (G5.1 / AA.2) – 0.16%.

The majority of the **scrub** on the site belongs to Species-rich hedgerows of native species (FA.3 / B7.123), covering 0.55% of the site area. The only other type of scrub belongs to the type of Broad-leaved xerophilous shrubs according to the national classification (B2.1), which correspond the best to the Subcontinental and continental deciduous thickets according to EUNIS type (F3.24), and covers 0.09% of the site area.

Marshland was recorded within the site (covering 0.21% of the site area), and belongs to *Phragmites australis* beds normally without free-standing water (D5.11 / E4.111).

There is ***no grassland*** within the site, though elements of steppe vegetation are present within sparse ruderal vegetation of marginal habitats (track verges, hedges, field boundaries etc.). There are ***neither aquatic habitats*** within the site, though only scarce elements in certain irrigation canals.

The **artificial** habitat types (other than roads/tracks and irrigation canals) are agricultural structures (J / H2.4) – 0.06%, Waste deposits (J6 / HA) – 0.06%, Liquid agricultural wastes (J6.42 / HA.19) – 0.06%, and a small ruined building (J1.51 / H2.6) – <0.01%.

A smaller-scale scale habitat map of the WPP site area is provided in Figure 7-18, for convenience, whilst the larger-scale version is available in Appendix C. A list of habitat types recorded, with their protection and conservation status, and abundance within the site area, is available in Appendix C.

Figure 7-18 Habitats and Ecological Features of Concern within the Čibuk 2 WPP Site and in the Immediate Vicinity

Source: GoogleEarth 2022, NES, with modification by U. Buzurović, I. Karapandža, and B. Karapandža, original

Legend and notes: Location of all habitat types within the WPP boundaries identified according to EUNIS (EEA 2017) habitat code (for clearer presentation arable farmland – EUNIS code I1.12, is not coloured); locations of WTGs of Čibuk 2 (W) are also shown.

7.3.3.2 Marshland (Mires, bogs and fens)

7.3.3.2.1 Marshland Types at the WPP Site

D5.11 *Phragmites australis* beds normally without free-standing water

National code: **E4.111**

EU Habitats Directive Annex I: ***none***

Phragmites australis beds of the Palaearctic region dry for at least a large part of the year, often invaded by other herbaceous species.

This habitat type covers a small area of the site (0.21%). There are 3 fragments with a total surface area of 10.14 ha. They are all located in the areas of particular canals (canalized rivers): two by the designated Ecological Corridors of Local Importance on the south and southeast margin, and one in the central part of the site (see section 7.3.2.4).

It is of **no conservation concern,** and of **no conservation value at local, regional, national or international level**.

7.3.3.2.2 Flora and Fauna Interest of the Marshland at the Site and Surroundings

Although small, all marshland fragments at the site are of particular interest for certain specialist bird species (which are accordingly recorded at the site only within these habitats). They also provide trophic resources for all bats, and thus the most important foraging area at the site, used by a number of species, has been identified in the wider area around the marshland fragment on the southeast margin (Figure 7-25). Except within the three small fragments of marshland habitats, elements of marsh vegetation are scarce in the irrigation canals at the site. Larger and more important marshland is present in the site immediate surroundings, the most important within the Kraljevac SNR (see section 7.3.2.1.2). Described species-specific interest (along with relevant populations' nature conservation value) defines species-specific nature conservation value of marshland at the site for certain birds and all bats, though valued only at the **local** level (**minor to moderate**), which is considered as **not significant** (as elaborated in sections 7.3.4.1 and 0).

7.3.3.3 Scrub and Woodland

7.3.3.3.1 Scrub and Woodland Types at the WPP Site

F3.24 Subcontinental and continental deciduous thickets
National code: **B2.1**
EU Habitats Directive Annex I: ***none***

Deciduous pre- and post-forest formations, forest edges, hedges and woodland recolonisation of thermophilous deciduous oak forest and steppe forest zones of the Balkan peninsula, of southeast Europe, of west Asia and of Central Eurasia, in particular, of the *Quercion frainetto* and *Ostryo-Carpinion* zones of the Balkan peninsula, with very local irradiations in Central Europe, extreme northeast Italy, the Aegean and the east Mediterranean.

This habitat type covers a very small area of the site (0.09%). There are several small fragments with a total surface area of 4.32 ha, all located by the west boundary.

It is of **no conservation concern,** and of **no conservation value at local, regional, national or international level**.

FA.3 Species-rich hedgerows of native species
National code: **B7.123**
EU Habitats Directive Annex I: ***none***

Hedgerows are composed mainly of native species, with on average at least five native woody species per 25 m length, excluding undershrubs such as *Rubus fruticosus* or climbers such as *Clematis vitalba* or *Hedera helix*. In west Europe, many such hedges are thought to be medieval in origin.

This habitat type covers a small area of the site (0.55%) with a total surface area of 26.18 ha. Most of the several present fragments are belts along the tracks, with some along the canals and very few between the fields.

It is of **no conservation concern**, and of **no conservation value at local, regional, national or international level**.

G1.C3 *Robinia* plantations
National code: **AA.12E**
EU Habitats Directive Annex I: ***none***

Includes plantations and spontaneous formations of *Robinia pseudacacia*. Vegetation of alliances *Chelidonio-Robinion* and *Balloto nigrae-Robinion*.

This habitat type covers a small area of the site (0.13%), with a total surface area of 6.14 ha. There are only two small fragments in the marginal areas of the site: a larger area in southwest corner (Figure 7-19), and a smaller area by the west boundary. Both fragments are young spontaneous formations, between 5 and 10 m high, with almost none other species of trees and shrubs present within.

It is of **no conservation concern**, and of **no conservation value at local, regional, national or international level**.

G1.D4 Fruit orchards
National code: **B7.22**
EU Habitats Directive Annex I: ***none***

High-stem orchards of apple, pear, plum, apricot, peach, cherry and other Rosaceae.

This habitat type covers a small area of the site (0.31%) with a total surface area of 14.67 ha. There are several small fragments, all except one located by the west boundary.

It is of **no conservation concern**, and of **no conservation value at local, regional, national or international level**.

G5.1 Lines of trees
National code: **AA.2**
EU Habitats Directive Annex I: ***none***

More or less continuous lines of trees forming strips within a matrix of grassy or cultivated land or along roads, typically used for shelter or shading. Lines of trees differ from hedgerows (FA) in being composed of species that can grow to at least 5 m in height and are not regularly cut down to a height below 5 m.

This habitat type covers a small area of the site (0.16%) with a total surface area of 7.46 ha. All of the fragments are actually a discontinued belt along the canal (i.e. canalized river) designated as an Ecological Corridor of Local Importance located on the south site margin (see section 7.3.2.4).

It is of **no conservation concern**, and of **no conservation value at local, regional, national or international level**.

Figure 7-19 The Largest Woodland Fragment at the Site (in Southwest Corner) and by Far Larger Majur Fragment (Just beyond the West Site Boundary) in the Background

7.3.3.3.2 Flora and Fauna Interest of the Scrub and Woodland at the Site and Surroundings

Within the WPP site there are a few very small woodland/scrub fragments and several more linear areas, totalling about 58.77 ha, i.e. 1.24% of the site area. Most of the fragments are of anthropogenic origin, mostly orchards – totalling about 14.67 ha. Two small and young False Acacia (*Robinia pseudoacacia*) stands are spontaneously formed on abandoned or disturbed land. The majority of the woodland/scrub at the site belongs to linear vegetation (33.64 ha total), mostly present along certain sections of more important tracks (Figure 7-20) and along the certain irrigation canal. Outside of the fragments, woodland and shrub vegetation is scarce, and only sparse individual trees and shrubs are present, very rarely in small groups, mostly on track verges and at the basis of the OHL towers. Larger, older and thus ecologically more important woodland fragment is Majur, located just beyond the site west boundary (Figure 7-19).

Figure 7-20 Deliblato Road is Paved with Crushed Stone and with Linear Scrub Vegetation Along

Woodland/scrub fragments are usually essential for the conservation of biodiversity within otherwise vast farmland areas. However, very small (and young) woodland/scrub fragments at the site are of very limited ecological value and provide shelter for only a very few game species (Hare, Fox, and Badger) that forage in surrounding farmland. Unlike some other areas in South Banat, there are no areas of woodland at the site that are managed by local hunters (to support game populations).The overall nature conservation value of woodland/scrub fragments at the site for fauna is assessed as **negligible**.

Nevertheless, woodland/scrub fragments at the site, and even individual elements of woodland and shrub vegetation, are of some importance for the local bird and bat communities. Species-specific bird interest is provided by woodland/scrub fragments as they provide nesting and resting opportunities for many species that forage in surrounding farmland where suitable nesting and perching sites are very sparse, they provide food for many frugivorous and insectivorous species and sheltering from the elements (especially during the winter when fields are bare), as well as all the resources for a number of species not adapted to farmland habitats in any aspect (which thus exclusively/mostly occur only within or close to these fragments). Also, they provide food resources for all bats. This is particularly important for clutter-adapted and gleaning woodland specialist species (which hunt their prey from or near woodland/scrub vegetation) not adapted to farmland habitats, which thus exclusively/mostly occur only within or close to these fragments. Moreover, the foraging activity of all bat species is regularly focused around woodland/scrub vegetation, since concentration of all potential prey is regularly many times higher there than within surrounding fields. However, woodland fragments and individual trees within the site have no roosting potential, as clearly established by the ESIA Roost Surveys (see section 7.3.6.1.1),there are no features that bats could use for roosting (holes, cracks, partially detached bark etc.) due to the young age of the stands/trees. A very limited number of such features has been identified only within the Majur fragment beyond the site boundary. Considering all the above (along with relevant populations' nature conservation value), the species-specific nature conservation value of woodland habitats within the site for birds and bats, has been assessed as **minor to major local** (as elaborated in sections 7.3.4.1 and 0), and is **not significant**.

7.3.3.4 Farmland (Cultivated habitats)

7.3.3.4.1 Farmland Types Within the WPP Site

I1.1 Intensive unmixed crops
National code: **G1.1**
EU Habitats Directive Annex I: ***none***

Cereal and other crops grown on large, unbroken surfaces in open field landscapes.

By far the most abundant habitat type at the site (96.86%) with a total surface area of 4593.97 ha. The predominant crops grown within the site are maize (*Zea mays*), common wheat (*Triticum aestivum*) and sunflower (*Helianthus annuus*) and, to a lesser extent, alfalfa (*Medicago sativa*). A small but significant part of the farmland is used for commercial cultivation of medicinal plants, the chamomile (*Matricaria chamomilla*) and lemon balm (*Melissa officinalis*).

It is of **no conservation concern**, and of **no conservation value at local, regional, national or international level**.

7.3.3.4.2 Flora and Fauna Interest of the Farmland at the Site and Surroundings

The entire survey area comprises farmland with only very scarce elements of any other vegetation. Hedgerows and unmanaged field boundaries are generally very rare with only sparse individual trees and shrubs and small patches of ruderal vegetation present. Intensively managed arable monocultures occupy about 96.86% of the site area. Roads and tracks, canals, and all other artificial habitats, as well as fragments of all semi-natural vegetation such as ruderal, scrub/woodland (including orchards), marshland and aquatic, only account for the rest 3.14%. Therefore, the overall habitat diversity and ecological value, as well as bird and bat interest, of the area are low.

However, farmland provides diverse trophic resources (crops, invertebrates, small vertebrates, etc.) for a number of occurring bird and bat species, including generalist species and/or those adapted to such habitats. It also provides nesting resources for ground-nesting bird species, as determined by these surveys (see section 7.3.5.1.1). All these constitute species-specific bird and bat interest of the farmland at the site. Such species-specific interest (along with relevant populations' nature conservation value) defines species-specific nature conservation value of farmland habitats, though valued only at the **local** level (**minor to major**) and thus **not significant** (as elaborated in sections 7.3.4.1 and 0).

7.3.3.5 Artificial Habitats

7.3.3.5.1 Artificial Habitat Types at the WPP Site

J Constructed, industrial and other artificial habitats
National code: **H**
EU Habitat Directive Annex I: ***none***

There are several buildings/structures and small complexes at the site used for agricultural or industrial purposes that could not be categorized to lower level of habitat classification schemes. These include a crop warehouse complex (Figure 7-4), a clay brick factory complex, an anti-hail station, a few tool-sheds, and several tin sheds where irrigation system pumps are kept. They cover a very small area of the site (0.06%) with a total surface area of 2.64 ha, and are mostly located on site margins.

It is of **no conservation concern**, and of **no conservation value at local, regional, national or international level**.

J1.51 Urban and suburban derelict spaces
National code: **H2.6**
EU Habitat Directive Annex I: ***none***

Disused factories, houses, offices, factories or other buildings; these structures would, while in use, have been classified as J1.1, J1.2, J1.3 or J1.4.

This is single poorly maintained (apparently not used) farmhouse building located on the south site margin, with total area of 0.1 ha.

It is of **no conservation concern**, and of **no conservation value at local, regional, national or international level**.

J4.2 Road network
National code: **H8.22**
EU Habitat Directive Annex I: ***none***

Road surfaces and car parks, together with the immediate highly-disturbed environment adjacent to roads, which may consist of roadside banks or verges.

This habitat type covers a small but significant area of the site (0.96%) with a total surface area of 45.71 ha. These are uncategorized rough tracks, mostly plain dirt tracks allowing access to the fields for farming. The tracks are located between the fields or between the fields and canals.

It is of **no conservation concern**, and of **no conservation value at local, regional, national or international level**.

J5.4 Highly artificial non-saline running waters
National code: ***H9.5***
EU Habitat Directive Annex I: ***none***

Artificial watercourses and basins, together with their associated containers, carrying fresh water with perceptible flow. Includes sewers, running discharges from extractive industrial sites, subterranean artificial watercourses, and channels with completely man-made substrate. Excludes fountains and cascades.

This habitat type covers a small area of the site (0.55%) with a total surface area of 26.22 ha. This is a network of irrigation canals crossing parts of the site. The vast majority of the canals at the site did not hold any water during the ESIA Habitat Surveys (in late May) and are overgrown with herbaceous ruderal vegetation and occasionally low scrub, lacking any marsh vegetation. Only two of the canals, actually canalized rivers designated as Ecological Corridors of Local Importance on the site margins (see section 7.3.2.4), held some water and harboured some aquatic and marsh vegetation.

It is of **no conservation concern**, and of **no conservation value at local, regional, national or international level**.

J6 Waste deposits

National code: **HA**
EU Habitat Directive Annex I: none

Tips, landfill sites and slurries produced as by-products, usually unwanted, of human activity.

This habitat type covers a very small area of the site (0.06%) with a surface area of 2.65 ha. There is a single small inactive landfill, covered with earth and mostly overgrown in herbaceous vegetation. It is located in the former clay excavation site adjacent to the brick factory in the southwest site corner.

It is of **no conservation concern**, and of **no conservation value at local, regional, national or international level**.

J4.1 J6.42 Liquid agricultural wastes

National code: **HA.19**
EU Habitat Directive Annex I: ***none***

Liquid agricultural wastes, manure.

This habitat type covers a very small surface (with total area of 2.90 ha) within the survey area.

This habitat type covers a very small area of the site (0.06%) with a surface area of 2.6p ha. This a storage lagoon for digestate of the biogas plant situated in nearby Mramorak village.

It is of **no conservation concern**, and of **no conservation value at local, regional, national or international level**.

Figure 7-21 Farm Tracks Are Often Overgrown in Ruderal Herbaceous Vegetation, in Particular along the Verges, with Scarce Woodland/Scrub Vegetation along

7.3.3.5.2 Flora and Fauna Interest of the Artificial Habitats at the Site and Surroundings

Canals

A system of irrigation canals crosses the site. Irrigation canals are classified as artificial habitat, though the elements of natural vegetation are present in the canals at the site. A vast majority of the canals at the site are almost completely and permanently dry and overgrown with weeds and occasionally low bushes, lacking any elements of aquatic or marsh vegetation (Figure 7-8). Elements of marsh vegetation are only present in and around certain canals (canalized rivers) designated as Ecological Corridors of Local Importance located on the site margins, along which woodland/scrub vegetation is also more represented (see section 7.3.2.4). However, the canal network introduces fragments and elements of natural vegetation across the site and significantly increases habitat diversity and overall biodiversity within the surrounding farmland. This is of particular interest for certain bird species that are not fully adapted to farmland habitats, as the canals provide foraging and nesting opportunities for them. Presence of natural vegetation in canals multiplies the abundance and diversity of invertebrate fauna and enhances trophic base of insectivorous species (a number of bird and all bat species) across the site. Being the most distinctive linear elements within surrounding fields (besides the tracks), the canals are typical features that most bats use for commuting, as well as foraging habitat for a number of bat species, as confirmed by the surveys (Figure 7-25). Considering all the above (along with relevant populations' nature conservation value), the species-specific nature conservation value of canals within the site for birds and bats, has been assessed as **minor to major local**, and **not significant** (as elaborated in sections 7.3.4.1 and 0).

Roads/tracks and ruderal vegetation

An extensive network of rough tracks (with a total length of about 47 km) accounts for about 0.96% of the site area. Only a few of the tracks (or sections) are surfaced with crushed stone (Figure 7-20), whilst the majority are plain dirt tracks (Figure 7-21) which are very dusty when dry and muddy following rain, particularly in depressions where rainwater is often retained for days, forming water pans and pools (puddles). The tracks are managed by farmers themselves, mostly very basically, and thus herbaceous vegetation develops seasonally on most of them (Figure 7-21). This vegetation grows extensively on less-used tracks and is composed of herbaceous ruderal species, crops, invasive alien species (e.g. Aleppo Grass *Sorghum halepense* – Lazarević *et al.* 2012), and seldom elements of steppe vegetation. The same vegetation is also characteristic of the dry irrigation channels, with sparse low shrubs occasionally (Figure 7-8).

The tracks are used as display and nesting grounds by a number of occurring farmland birds (particularly ground-nesting species that prefer more open vegetation structure than in surrounding fields). They also provide food resources for some of these species and dust (for dust-bath) for even more bird species. The tracks provide food resources for bats as well with the concentration of all potential bat prey regularly higher along the tracks than within surrounding fields, and certain tracks allow hunting for the bat species that collect their prey from the ground, which is not possible within the fields. Also, being almost only ubiquitous and distinctive linear elements within surrounding fields (besides canals), and connecting the fields with surrounding settlements where most of the bats roost, the tracks are used as commuting routes by a number of occurring bats, as confirmed by the surveys (Figure 7-25). They also provide water (for drinking) for some of the bird and bat species in otherwise water-scarce farmland. Described species-specific interest (along with relevant populations' nature conservation value) defines species-specific nature conservation value of tracks at the site for birds and bats, which is assessed as **minor to moderate local** (as elaborated in sections 7.3.4.1 and 0), and is **not significant**.

Other artificial habitats and built structures

Artificial habitats other than track and canal networks cover a small area of the site (0.17%) with a total surface area of 8.29 ha. Within the site there are several very specific artificial habitat, mostly located on the site margins. These include (Figure 7-18): biogas plant digestate lagoon, inactive landfill, and several tin sheds where irrigation system pumps are kept. There are also several buildings and small complexes, mostly located on the site margins as well: crop warehouse complex (grey arrow 1 on Figure 7-18), old industrial chimney, presumably of former brickyard (grey arrow 2), anti-hail station (grey arrow 3), brick factory (grey arrow 3), and 5 small agricultural buildings – tool-sheds (orange arrows).

Built structures potentially provide nesting opportunities for a few bird species, as well as roosting opportunities for a number of bat species. All built structures at the WPP site were subjected to ESIA Bat Roost Surveys and Breeding Bird Surveys (to the extent it was possible), and neither nesting birds nor roosting bats have been found, not even an indication of nesting/roosting (see sections 7.3.5.1.1, 7.3.6.1.1 and Appendix C). Furthermore, all built structures at the site have been evaluated as having negligible roosting potential, none for larger numbers of bats. They could be only occasionally used by displaying bats, although such use was not recorded by these surveys. Therefore, the nature conservation value of built structures at the site for all bird and bat species is assessed as **negligible**, and thus **not significant** (as elaborated in sections 7.3.4.1 and 0).

All other artificial habitats at the site are of no potential fauna interest, birds and bats included.

Transmission lines

Two 400 kV OHLs join on the west site margin (Figure 7-22, EMS 2021), one running from the southwest (No. 453/2) and another from the southeast crossing the site (No. 453/1). From the junction point, a double circuit line (actually Čibuk 1 WPP connection OHL) crosses the site along west boundary and then turns to northeast, towards the Čibuk 1 substation.

The OHLs provides nesting and perching opportunities for a number of bird species, as confirmed by these surveys (see section 7.3.5.1.1 and Appendix C). This is particularly important considering the sparsity of such opportunities in surrounding farmland. The nature conservation value of the transmission line for a number of birds is assessed as **minor to major local** (as elaborated in sections 7.3.4.1), and thus **not significant**.

Figure 7-22 The Junction Point of the OHLs on the West Site Margin

7.3.3.6 Other habitat/landscape elements

Vertical loess faces

There are 3 uncovered, high (up to 10 m), vertical (or very steep) loess faces within the site boundaries. They are all relatively small (20-50 m in length) and of artificial origin. Two of them are located on the sides of the roadcuts made in the loess terrace slope on the site west boundary (yellow arrows 1 and 2 on Figure 7-18) to facilitate certain rough tracks, whilst one was created by earlier excavation of clay (yellow arrow 3). Vertical loess faces provide nesting resource for a few, though valued, specialised burrow-nesting bird species (Figure 7-6), as confirmed by these surveys (see section 7.3.5.1.1 and Appendix C), and thus their nature conservation value for these species is assessed as **major local**, i.e. **not significant** (as elaborated in section 7.3.4.1).

7.3.4 Flora and Fauna

7.3.4.1 Flora

A total of **93 species** of plants was recorded within the WPP site during the ESIA Surveys. The complete list of species, with their protection and conservation status as well as their distribution and ecological status in the site area is provided in Appendix C. All of the recorded plant species are of **no conservation concern**, and therefore of **no conservation value at local, regional, national or international level**.

7.3.4.2 Invertebrates

A total of **47 species** of insects was recorded within the WPP site during the ESIA Surveys. The occurrence of 118 more species could be expected based on the published records from wider surroundings and species ecology and distribution, totalling ***165 species*** (potentially) occurring within the WPP site. The complete list of all species, with their protection and conservation status, as well as their occurrence and ecological status in the site area is given in Appendix C. Most of these species are of **no conservation concern** and no **conservation value**.

The conservation evaluation of populations and habitats within the WPP site of 4 recorded and 3 potentially occurring species of conservation concern is presented below.

All four recorded species of conservation concern are butterflies Strictly Protected in Serbia: Lesser Purple Emperor (*Apatura iris*), Cardinal Fritillary (*Argynnis pandora*), Large White (*Pieris brassicae*) and Swallowtail (*Papilio machaon*). None of these are listed on any relevant international legislation or threatened at any level (global, European, or national). Lesser Purple Emperor was recorded at a single location, close to the overgrown canal. The remaining three species were each recorded at several locations, along the tracks and field edges. The nature conservation value of all these 4 species' populations and habitats at the site is assessed as **negligible**.

All three potentially occurring species of conservation concern are also butterflies Strictly Protected in Serbia: Reverdin's Blue (*Plebejus argyrognomon*), Large Copper (*Lycaena dispar*), Camberwell Beauty (*Nymphalis antiopa*). Large Copper is also listed on Annexes II and IV of the EU Habitats Directive and Appendix II of the Bern convention. The nature conservation value of all these 3 species' populations and habitats at the site is assessed as **negligible**.

Due to all the above, the nature conservation value of populations and habitats within the WPP site of all (potentially) occurring insect species is considered **not significant**.

7.3.4.3 Amphibians

Only **2 species** of amphibian were recorded within the WPP site during the ESIA Surveys: Common Spadefoot Toad (*Pelobates fuscus*), and Green Toad (*Bufo viridis*). Occurrence of additional species is not expected (except possibly incidental visits on the site margins not relevant for this assessment), due to the lack of suitable (aquatic) habitats. The list of species, with their protection and conservation status, as well as their occurrence and ecological status in the site area is given in Appendix C.

Both occurring species are of conservation concern, being Strictly Protected in Serbia, as well as listed on Annex IV of the EU Habitats Directive and on Appendix II of the Bern convention. Considering the small number and rare occurrence at the WPP site of both these species, the nature conservation value of all amphibian populations at the WPP site is assessed as **minor** to **moderate local** at the most.

The lack of permanent aquatic habitats indicates that the WPP site is not suitable for most amphibian species (newts in particular). However, some species of frogs and toads spend most of their life cycle away from water, returning to it only to breed. Such species can also be found at great distances from water. Habitats within the site, especially scrub and a elements of grassland can provide suitable conditions for the life and survival of some species of amphibians. Therefore, during reproduction (early spring) most of these species need aquatic habitats, which are extremely rare within the WPP site. Due to all the above, the nature conservation value of all amphibian habitats at the WPP site is assessed as **negligible**.

Due to all the above, the nature conservation value of populations and habitats within the WPP site of all (potentially) occurring amphibian species is considered **not significant**.

7.3.4.4 Reptiles

A **single species** of reptile was recorded within the WPP site during the ESIA Surveys: Western Green Lizard (*Lacerta viridis*). Habitats within the site are not considered particularly suitable for most reptiles, and occurrence of additional species is not expected (except possibly incidental visits not relevant for this assessment). The list of species, with their protection and conservation status, as well as their occurrence and ecological status in the site area is given in Appendix C.

Western Green Lizard is a species of conservation concern, being listed on Annex IV of the EU Habitats Directive, and also on Appendix II of the Bern convention. It was abundant during the surveys, often observed basking on paths or tracks across the site. However, regional population of the species is also very large, and local populations constitute a negligible part of them. Considering also the fact that it is not threatened (LC) at any level, the nature conservation value of Western Green Lizard populations and habitats at the site is assessed as **negligible**.

Due to all the above, the nature conservation value of populations and habitats within the WPP site of all (potentially) occurring reptile species is considered **not significant**.

7.3.4.5 Ground Mammals

A total of **20 species** of mammals was recorded within the WPP site and the immediate surroundings, 17 of these during the ESIA Surveys. Five species, the European Water Vole (*Arvicola amphibius*), Yellow-necked Field Mouse (*Apodemus flavicollis*), Least Weasel (*Mustela nivalis*), Eurasian Otter (*Lutra lutra*), and Wild Cat (*Felis silvestris*), were only recorded during the ESIA Team members' surveys unrelated to this assessment, and only in the site surroundings (mostly within Kraljevac SNR). However, the occurrence of Eurasian Otter and Wild Cat at the site can be positively excluded (except possibly incidental visits on site margins not relevant for this assessment), due to lack of suitable habitats (aquatic habitats and larger woodland). The occurrence of 3 more species is considered probable, and possible for a further 6, totalling ***29 species*** (potentially) occurring within the WPP site. The complete list of species, with their protection and conservation status, as well as their occurrence and ecological status in the site area is given in Appendix C.

The occurrence of European Ground Squirrel (*Spermophilus citellus*), which was recorded at the site in 2011 according to single source (Bas 2021), was not confirmed by either later systematic studies (Nikolić 2019, Consultant's data) or exhaustive surveys within the scope of this ESIA. Moreover, these surveys did not even identify any suitable (grassland) habitats within the site. It is thus ascertained that European Ground Squirrel does not occur within the site and the immediate surroundings, at least not currently (and it is also possible that the 2011 record was incorrectly georeferenced).

Only 3 potentially occurring species are of conservation concern: Common Hamster (*Cricetus cricetus*), Eurasian Harvest Mouse (*Micromys minutus*), and Stoat (*Mustela erminea*). All three species are Strictly Protected in Serbia, whilst Common Hamster is also listed on Annex IV of the EU Habitats Directive and Appendix II of the Bern convention. However, habitats at site are suboptimal (at the most) for these species, and thus all three possibly occur within the WPP site only in very small numbers, Stoat only as a visitant. Considering also the fact that none of the three species are threatened (at least not at European or national level), the nature conservation value of Common Hamster, Eurasian Harvest Mouse and Stoat populations and habitats at the site is assessed as **negligible**.

Due to all the above, the nature conservation value of populations and habitats within the WPP site of all (potentially) occurring mammal species excluding bats is considered **not significant**.

7.3.5 Birds

7.3.5.1 Survey Results

An overview of the results of the pre-construction 2020-2022 Čibuk 2 ESIA Surveys is provided in this section, as well as comparisons with previous Čibuk 1 2018 pre-operational and 2009-2012 ESIA survey results, where relevant. Full results of the 2020-2022 Čibuk 2 ESIA Surveys are provided in Appendix C, whilst those of the previous Čibuk 1 surveys are available in corresponding reports and their Appendices (Rašajski 2011, Paunović & Karapandža 2011a, b, Watts 2012, Karapandža & Paunović 2018, 2019). It should be noted that Čibuk 2 and Čibuk 1 sites are clearly separated (Figure 5-5), and thus the survey area of these ESIA Surveys does not overlap with the previous Čibuk 1 surveys (except negligibly for Breeding Raptor Surveys). The two sites also differ ecologically in geomorphology, habitat composition, and location relative to surrounding designated sites and other more preserved natural habitats (Deliblato Sands in particular). Therefore, the results of Čibuk 1 bird surveys are not all entirely relevant to this Čibuk 2 ESIA, except for comparison, i.e. relative evaluation of the two sites' bird interests.

A total of ***146*** bird **species** was recorded in the area of both WPP sites and immediate surroundings between 2009 and 2022 (

Table 7-4). 140 of these species were recorded by 2009-2018 Čibuk 1 surveys, whilst only **86** by this 2020-2022 Čibuk 2 ESIA. Such difference in species richness alone, where Čibuk 2 site is significantly poorer (as expected by the SS), confirms the ecological distinction between the two sites.

Of the 86 species occurring at the Čibuk 2 WPP site and immediate surroundings, 84 were recorded by the ESIA Bird Surveys. Saker Falcon (*Falco cherrug*) was only recorded beyond the scope and the period of the ESIA bird surveys (as elaborated in section 7.3.5.1.4). Rosy Starling (*Pastor roseus*) observation from 2020 (Popović 2020), is the only record found by the desk study that could be unambiguously attributed to the WPP site. Occurrence of additional species, particularly some of those recorded at the Čibuk 1 site, might not be completely excluded though only as a rare or incidental passage of single or a few individuals, and thus not relevant for this assessment.

The 86 species recorded in the site area accounts for about 24% of the national bird fauna (BPSSS 2017). In terms of species richness/diversity alone, the bird fauna of the site and immediate surroundings can be evaluated as **moderately poor**.

In terms of taxonomy, within the Čibuk 2 site and immediate surroundings the most numerous by far are the passerines (Passeriformes) with 66 species occurring. All other groups are represented by only a few species, e.g. 4 Columbiformes, 3 Charadriiformes (2 of which gulls), 5 (3+2) raptors (Accipitriformes + Falconiformes), 2 owls (Strigiformes), and 2 Coraciiformes. In this respect, the bird community of Čibuk 2 site is even poorer compared to the Čibuk 1 where numbers of e.g. Charadriiformes, raptor and owl species are several times greater (7, 18 and 5, respectively), and many groups not recorded at the Čibuk 2 occur, e.g. waterfowl (Anatidae), cranes (Gruidae), storks (Ciconiidae), herons (Ardeidae), cormorants (Phalacrocoracidae), woodpeckers (Piciformes) etc.

7.3.5.1.1 Breeding Birds

Breeding bird population estimates from the 2021 Čibuk 2 ESIA Breeding Farmland Bird Surveys, Breeding Raptor Surveys, Breeding Owl Surveys, and occasional observations (over the course of VP Surveys and other ecological surveys, non-raptor species recorded during Breeding Raptor Surveys etc.) are summarised in Table 7-1, whilst full survey results are available in Appendix C. An overview of breeding population estimates from the Čibuk 1 2018 surveys is available in Table 3 of the pre-operational assessment report (Karapandža & Paunović 2019), along with those from 2009-2012 surveys (as such comprehensive overview is not provided in the ESIA/EIA or any of the original survey reports), whilst full survey results are available in corresponding reports' Appendices.

Breeding of **22 species** was confirmed within the Čibuk 2 WPP site boundary and immediate surroundings in 2021 breeding season (17 of which within the site), and their breeding populations estimated based on the surveys (Table 7-1). The breeding of 23 more species within the WPP site boundary and/or in immediate surroundings was either recorded but not quantifiable or considered very likely based on their ecology and occurrence, activity and behaviour observed, thus totalling **45 breeding species** (

Table 7-4). This number is significantly lower than the 61 breeding species of the Čibuk 1 site.

Table 7-1 Estimates of Breeding Bird Population at the Čibuk 2 WPP Site and Immediate Surroundings for 2021

Numbers in column 1 - same as in

Table 7-4, for convenience;

Breeding farmland bird surveys - number of breeding pairs / territories within the WPP site extrapolated from the numbers recorded within the sampled 1 km2 squares): confirmed-possible;

Breeding raptor surveys - number of active nests / occupied home ranges recorded: within the WPP site, () - up to 2 km beyond the site boundary;

Occasional observations - number of breeding pairs / adult individuals* recorded: within the WPP site, () - beyond the site boundary.

Target species are highlighted

No.	Species name		Breeding farmland bird surveys	Breeding raptor surveys	Occasional observations
	Scientific	English			
1	*Coturnix coturnix*	Common Quail	35-111		2
2	*Phasianus colchicus*	Common Pheasant			1
38	*Asio otus*	Long-eared Owl		3+(1)	
51	*Buteo buteo*	Common Buzzard		(2)	
53	*Merops apiaster*	European Bee-eater			11
62	*Falco tinnunculus*	Common Kestrel		2+(5)	
68	*Lanius collurio*	Red-backed Shrike	28-35		5+(1)
73	*Pica pica*	Eurasian Magpie			2+(2)
76	*Corvus corax*	Northern Raven	7-7		2
77	*Corvus cornix*	Hooded Crow			2
83	*Riparia riparia*	Sand Martin			37
89	*Galerida cristata*	Crested Lark	7-14		1
91	*Alauda arvensis*	Eurasian Skylark	139-153		6+(1)
92	*Acrocephalus arundinaceus*	Great Reed Warbler			1+(1)
99	*Sylvia atricapilla*	Eurasian Blackcap			(1)
101	*Curruca communis*	Common Whitethroat	21-28		3
116	*Luscinia megarhynchos*	Common Nightingale	14-14		1
119	*Saxicola rubicola*	European Stonechat	42-63		2+(1)
127	*Motacilla flava*	Western Yellow Wagtail			2
128	*Anthus campestris*	Tawny Pipit	21-42		2
132	*Fringilla coelebs*	Common Chaffinch			(3)
135	*Chloris chloris*	European Greenfinch			(1)
Number of species			**9**	**3**	**9**
Number of target species			**0**	**3**	**0**
Total number of species			**22**		
Total number of target species			**4**		

The active nests/occupied home ranges of only three owl and raptor species were recorded by Breeding Raptor Surveys in 2021 breeding season: Long-eared Owl (*Asio otus*), Common Buzzard (*Buteo buteo*) and Common Kestrel (*Falco tinnunculus*). Based on the presence within the WPP site and in immediate surroundings, species ecology and suitable ecological conditions, breeding of one more owl species, the Little Owl (*Athene noctula*), is considered very likely in the site immediate surroundings, though in very small numbers. Nesting of all other owl and raptor species at the WPP site and in immediate surroundings is not considered likely. This number is several times lower compared to that of the Čibuk 1 site area where breeding of 5 owl and 7 raptor species was confirmed or indicated, mostly in the site immediate surroundings on the margins of the Deliblato Sands.

The most abundant breeding populations at the Čibuk 2 WPP site and immediate surroundings belong to **ground-nesting farmland birds** widespread throughout the area (although some are notifiable features of local IBAs), mostly small passerines: Eurasian Skylark (*Alauda arvensis*), European Stonechat (*Saxicola rubicola*), Common Quail (*Coturnix coturnix*), and Tawny Pipit (*Anthus campestris*). The following are species which use shrubs and hedges, also mostly small passerines (although some are notifiable features of local IBAs and nationally important sites), such as Red-backed Shrike (*Lanius collurio*), Common Whitethroat (*Curruca communis*), and Common Nightingale (*Luscinia megarhynchos*), and burrow-nesting colonial species restricted to vertical loess faces on southwest site margin – Sand Martin (*Riparia riparia*) and European Bee-eater (*Merops apiaster*). The farmland bird community composition and population densities are very similar to those at the Čibuk 1 site. However much more species breed within Čibuk 1 site, including certain tree-nesting species. None of these species were recorded within the Čibuk 2 site where such habitat elements are very scarce, though only within (larger and older) woodland fragments in the site surroundings.

7.3.5.1.2 Wintering Birds

Wintering bird population estimates from the 2021/2022 Čibuk 2 ESIA Wintering Bird Surveys, along with observations over the course of VP Surveys from wintering period (which cannot be reliably quantified), are summarised in Table 7-2, whilst full survey results are available in Appendix C. Wintering bird population estimates for Čibuk 1 are not available. Wintering Bird Surveys were not undertaken within the scope of any of the previous Čibuk 1 surveys, as they were not considered necessary (which is likely to have been confirmed as appropriate by these surveys). However, comprehensive overviews of wintering bird populations occurrence at the Čibuk 1 site are provided within the scope of the evaluation of species' ecological status: for 2018 in Table 5 of the pre-operational assessment report (Karapandža & Paunović 2019), and for 2009-2012. in Tables C.5 и C.8 of the ESIA Report (Atkins 2014).

Wintering of **35 species** was confirmed within the Čibuk 2 WPP site boundary and immediate surroundings in 2021/2022 wintering season. This number is significantly lower compared to 56 wintering species of the Čibuk 1 site.

Table 7-2 Estimates of Wintering Bird Population at the Čibuk 2 WPP Site and Immediate Surroundings for 2021/2022

Numbers in column 1 - same as in

Table 7-4, for convenience;

Wintering bird surveys - total number of individuals recorded during a single survey visit: minimum-maximum;
Vantage point surveys - recorded during VP surveys in the period December-February.
Target species are highlighted

No.	Species name		Wintering bird surveys	Vantage point surveys
	Scientific	English		
2	*Phasianus colchicus*	Common Pheasant		+
9	*Columba livia f. domestica*	Domestic (Feral) Pigeon		+
11	*Columba palumbus*	Common Wood Pigeon		+
13	*Streptopelia decaocto*	Eurasian Collared Dove		+
31	*Chroicocephalus ridibundus*	Black-headed Gull		+
32	*Larus michahellis*	Yellow-legged Gull		+
43	*Circus cyaneus*	Hen Harrier		+
51	*Buteo buteo*	Common Buzzard		+
62	*Falco tinnunculus*	Common Kestrel		+
70	*Lanius excubitor*	Great Grey Shrike		+
73	*Pica pica*	Eurasian Magpie		+
74	*Coloeus monedula*	Western Jackdaw		+
75	*Corvus frugilegus*	Rook		+
76	*Corvus corax*	Northern Raven		+
77	*Corvus cornix*	Hooded Crow		+
80	*Parus major*	Great Tit		+
81	*Cyanistes caeruleus*	Eurasian Blue Tit		+
89	*Galerida cristata*	Crested Lark		+
109	*Sturnus vulgaris*	Common Starling		+
111	*Turdus pilaris*	Fieldfare	7-46	+
114	*Turdus viscivorus*	Mistle Thrush	14-14	
119	*Saxicola rubicola*	European Stonechat		+
123	*Passer domesticus*	House Sparrow		+
124	*Passer montanus*	Eurasian Tree Sparrow		+
131	*Anthus spinoletta*	Water Pipit	19-27	+
132	*Fringilla coelebs*	Common Chaffinch	19-54	+
133	*Fringilla montifringilla*	Brambling	16-24	
135	*Chloris chloris*	European Greenfinch	45-142	+
136	*Spinus spinus*	Eurasian Siskin	4-4	+
137	*Carduelis carduelis*	European Goldfinch	59-265	+
138	*Linaria cannabina*	Common Linnet	79-423	+
141	*Coccothraustes coccothraustes*	Hawfinch		+
142	*Emberiza calandra*	Corn Bunting		+
143	*Emberiza citrinella*	Yellowhammer	6-75	+
146	*Emberiza schoeniclus*	Common Reed Bunting	6-41	+
		Number of species	**11**	**33**
		Number of target species	**0**	**3**

Total number of species	**35**
Total number of target species	**3**

Actual wintering populations belong to only 8 species, whilst most of the wintering birds belong to local resident populations (

Table 7-4), including two of the target species: Common Buzzard (*Buteo buteo*) and Common Kestrel (*Falco tinnunculus*).

The most abundant wintering populations at the Čibuk 2 WPP site and immediate surroundings belong to **small passerines**, such as Common Linnet (*Linaria cannabina*), European Goldfinch (*Carduelis carduelis*) and European Greenfinch (*Chloris chloris*). Mostly small wintering flocks (only exceptionally larger) of a few small passerine species occasionally forage in farmland within the site, although rest and shelter only beyond the site boundary. Hen Harrier (*Circus cyaneus*) is the only target species whose wintering population occurs at the site with single individuals of the species regularly forage within the site. Flocks (sometimes large) of wintering waterfowl, that were occasionally recorded in commuting flights above the Čibuk 1 site previously, were not observed at Čibuk 2 site, either commuting above or feeding on the ground.

7.3.5.1.3 Flight Activity

Details of target species flight activity were recorded during VP Surveys of these Čibuk 2 and previous Čibuk 1 surveys. An overview of flight activity from the Čibuk 2 2021-2022 surveys is provided in Table 7-3, whilst the full list of records and maps of flight trajectories are available in Appendix C. An overview of flight activity from the Čibuk 1 2018 surveys is provided in Table 4 of the pre-operational assessment report (Karapandža & Paunović 2019), and full survey results in Appendices. An overview of flight activity from the Čibuk 1 2009-2012 surveys is available in Tables C.6, C.7 и D.5. of ESIA Report (Atkins 2014), whilst full details are available in original survey reports.

The flight activity of a total of **6 target species** was recorded by the 2021-2022 VP Surveys at the Čibuk 2 WPP site and immediate surroundings (Table 7-3). This number is significantly lower compared to the Čibuk 1 site where the flight activity of 14 target species was recorded in 2018, 19 in 2011-2012, 20 in 2010-2011, and 17 in 2009-2010. Only 4 species of raptors (Accipitriformes and Falconiformes) and 2 Coraciiformes were observed at the Čibuk 2 site by the VP surveys, whilst at the Čibuk 1 site many more raptor species were observed, as well as flight activity of waterfowl (Anatidae), cranes (Gruidae), herons (Ardeidae), and storks (Ciconiidae). Neither commuting flocks of wintering waterfowl, Greylag Goose (*Anser anser*), Taiga Bean Goose (*Anser fabalis*), and Greater White-fronted Goose (*Anser albifrons*), nor small migrating flocks of Common Crane (*Grus grus*) and White Stork (*Ciconia ciconia*), nor even flights of single individuals of other waterbirds, which were recorded occasionally at the Čibuk 1 site, were observed at the Čibuk 2 site.

Little Owl (*Athene noctula*), Long-eared Owl (*Asio otus*), and Saker Falcon (*Falco cherrug*) are ***3*** more ***target species*** that were recorded at the Čibuk 2 site (by Breeding Owl Surveys, over the course of other ecological surveys and/ or occasional observations). However, not a single flight of these species was observed within the scope of VP Surveys and thus their flight activity cannot be quantified.

Table 7-3 Target Species Flight Activity Recorded by VP Surveys (March 2021 – February 2022) and Activity Indices

Numbers in column 1 - same as in

Table 7-4, for convenience;

Flight activity:

- F_t - total number of flights observed [n],
- I_t - total number of birds (individuals) observed [n],
- I_C - number of birds observed at blade swept height [n],
- O_t - total bird occupancy observed = birds x flight time [n x s],
- O_C - bird occupancy observed at blade swept height = birds at blade swept height x flight time at blade swept height [n x s].

Activity indices:

- I_t/h - total number of birds observed per survey hour (of the period species occurs at the site) [n/h],
- I_C/h - number of birds observed at blade swept height per survey hour (of the period species occurs at the site) [n/h],
- O_t/h - total bird occupancy observed per survey hour (of the period species occurs at the site) [n x s / h],
- O_C/h - bird occupancy observed at blade swept height per survey hour (of the period species occurs at the site) [n x s / h],
- rI_C - share of birds observed at blade swept height [%],
- rO_C - share of bird occupancy observed at blade swept height [%];

blade swept height: ^{1} - 30-200 m (highlighted), ^{2} - 70 240 m.

No.	Species name		Flight activity						Activity indices							
	Scientific	English	F_t	I_t	I_C	O_t	O_C^1	O_C^2	I_t/h	$I_C/^h$	O_t/h	O_C/h^1	O_C/h^2	rI_C	rO_C^1	rO_C^2
42	*Circus aeruginosus*	Western Marsh Harrier	21	21	20	4095	1620	271	0.88	0.83	170.63	67.50	11.28	95.2	39.6	6.6
43	*Circus cyaneus*	Hen Harrier	23	23	19	4425	1395	336	0.70	0.58	134.09	42.27	10.19	82.6	31.5	7.5
51	*Buteo buteo*	Common Buzzard	167	255	204	50220	21255	14674	3.54	2.83	697.50	295.21	202.20	80.0	42.3	27.4
53	*Merops apiaster*	European Bee-eater	22	71	62	11070	4935	1745	2.37	2.07	369.00	164.50	58.17	87.3	44.6	15.3
54	*Coracias garrulus*	European Roller	1	1	0	60	0	0	0.04	0.00	2.50	0.00	0.00	0.0	0.0	0.0
62	*Falco tinnunculus*	Common Kestrel	83	85	78	16366	6616	1732	1.18	1.08	227.31	91.89	24.06	91.8	40.4	10.4

Common Buzzard (*Buteo buteo*) was by far the most frequently recorded target species at the Čibuk 2 site, followed by Common Kestrel (*Falco tinnunculus*), although with half the number of flights and three times lower occupancy. These were also the two most frequently recorded target species at the Čibuk 1 site, with very similar activity. Both species were regularly observed in foraging flights of single individuals or sometimes pairs across the Čibuk 2 site. These are also the only two of the target species recorded at the Čibuk 2 site during all seasons. Far less frequent flight activity was observed for Western Marsh Harrier (*Circus aeruginosus*), recorded only during the migration season, and Hen Harrier (*Circus cyaneus*), observed almost only during the wintering. During the breeding season, a small flock of European Bee-eater (*Merops apiaster*) was regularly observed foraging above the southwest site margin and only occasionally elsewhere. Only a single flight of a single individual of European Roller (*Coracias garrulus*) was observed.

7.3.5.1.4 Saker Falcon (*Falco cherrug*) at the WPP Site and in the Wider Surroundings

Saker Falcon is globally threatened and scarce species (BirdLife International 2021, IUCN 2022). The resident breeding population of South Banat is highly valued, at Serbian level in particular (Rajković & Puzović 2018). Therefore, maximum precaution is justified and the data available that could possibly be relevant for this ESIA are summarised here. This includes data acquired through the ESIA surveys and desk study, as well as ESIA team own data from occasional observations and surveys unrelated to this assignment, from WPP site and immediate surroundings, and those from wider surroundings possibly relevant for this ESIA. Due to concern that disclosure of precise nesting locations in publicly available sources (such will be this report) could lead to persecution, and in line with the IfNCV policy on the matter, this information has been withheld (it can provided as confidential information at request) and present only in a general manner.

Nesting of Saker Falcon was ***not recorded*** by the ESIA Breeding Raptor Surveys in 2021 breeding season (Table 7-1) within the survey area extending 2 km beyond the site boundary, according implemented best practice (SNH 2017). This is in line with the recorded flight activity, since ***no flights*** of the species were observed by the ESIA VP Surveys (Table 7-3).

The only data on the Saker Falcon occurrence from the ESIA Surveys is the observation of a single (apparently immature) individual in the area of the OHLs junction on the site west margin during the site reconnaissance visit in January 2021 (before the systematic ESIA surveys commenced). This not indicative of nesting or occupied home range, since outside the breeding season individuals of the species, immatures in particular, disperse over broader areas (Prommer *et al*. 2012, European Commission 2015, Rajković & Puzović 2018).

The existence of the occupied home range south of the site that would also include south site margin, as stated in the NPCs, was not confirmed by targeted exhaustive surveys undertaken within the scope of the ESIA in this area (including the area beyond the Breeding Raptor Surveys survey area).

The occupied home ranges and nesting of the **two pairs** were confirmed in the **wider area** (beyond the Breeding Raptor Surveys survey area). One pair nested to the southwest of the Bavanište village, at a distance of about 4 km from the WPP site. According to the ESIA team data, this pair nested in this particular area only in 2021 and not in 2022, nor previously (according to all available information). According to the ESIA team data, another pair regularly nests north of the Dolovo village, at a distance of about 11 km from the WPP site, at least since 2018 when the nesting was confirmed by the Čibuk 1 pre-operational surveys (Karapandža & Paunović 2019).

According to the information from the GPS-tracked female (IfNCV 2022, M. Horváth 2021, official communication, BirdLife Hungary), this individual occurred within the site only outside the breeding season occasionally, and spent most of the breeding season 2021 in the area between the Deliblato and Gaj villages (at about 5 km to southeast from the WPP site). Targeted exhaustive surveys undertaken within the scope of the ESIA in this area found neither a nest nor territorial pair, which would be indicative of the existence of occupied home range, though only this single individual. It is positively concluded that particular individual did not nest and that the occupied home range was not established in particular area, at least not in breeding season 2021.

According to the ESIA team data, after the conclusion of the systematic ESIA surveys, in May 2022, in the area between the Dolovo and Mramorak villages that includes site immediate surroundings but also site north margin, regular occurrence and territorial behaviour of a Saker Falcon pair was observed, including hunting for pigeons on the outskirts of Dolovo and Mramorak villages. Although targeted exhaustive surveys were undertaken following this finding, neither nest nor any nesting indication was found. It is concluded that particular pair had only held hunting territory in particular area in 2022 (because the pair either did not nest in this season or nesting elsewhere failed). It remains open whether a nesting territory / occupied home range will be established in future in this area, where it did not exist for the last 12 years at least (according to the findings of these ESIA surveys, previous Čibuk 1 surveys, but also according to the overall knowledge of the ESIA team).

Considering all the above, it is concluded that at the time of writing **occupied home range** of Saker Falcon **existed neither** within the Čibuk 2 site nor in the immediate surroundings (potentially exposed to direct impacts of the project). However, it cannot be excluded that in the future a new home range that would marginally include the WPP sites north edge will be established.

7.3.5.2 Ecological Status

The ecological status of all 86 bird species recorded within the Čibuk 2 site boundary and immediate surroundings was assessed and is presented in

Table 7-4, along with the overview of records from the previous 2009-2018 Čibuk 1 surveys.

The surveys suggest that **75 species** actively **use** the WPP site and immediate surroundings, 65 for foraging, 45 for nesting, and 20 for resting. These are mostly typical farmland birds which nest on ground (or possibly in shrubs) and/or forage in fields, mostly small passerines. The following are species which use OHLs for nesting and perching, such as certain raptors and corvids, then synanthropic species (nesting in surrounding settlements), as well as a small number of woodland species adapted to utilise small fragments (mostly in site surroundings).

35 species occur at the WPP site and immediate surroundings only incidentally or rarely, 28 of them in negligible or small numbers, and 9 of them in a passage only.

The surveys did ***not*** record any regular occurrence of larger flocks of breeding or wintering birds that would be indicative of significant ***commuting flight paths*** between resting and foraging areas. This in line with findings of previous Čibuk 1 surveys (and of other WPPs) which concluded that the main commuting flight path of wintering waterfowl in the region was located along the DTD Canal and Deliblato Sands and that it was mostly used only during very cold winter periods when smaller surface waters in the region froze.

The WPP site is not situated within any recognised flyways, whilst the main migration route in the region follows the Danube valley (see section 7.3.2). The surveys did ***not*** record even incidental occurrence of the smallest ***migrating*** flocks. This also in line with findings of previous Čibuk 1 surveys (and of other WPPs) which concluded that the only a minor alternative migration route of Common Crane (*Grus grus*) and White Stork (*Ciconia ciconia*) in the region was located along the DTD Canal and Deliblato Sands.

The local bird community is mostly comprised of **resident** or **breeding** populations which nest and forage within the site and/or in the immediate surroundings. The WPP site has some importance for these populations, including resident/breeding populations of 3 target species: Common Buzzard (*Buteo buteo*), Common Kestrel (*Falco tinnunculus*) and European Bee-eater (*Merops apiaster*).

The WPP site has minimal importance for ***migrating*** and ***wintering*** populations. Only single migrating individuals of Western Marsh Harrier (*Circus aeruginosus*) and a few small passerine species occur and occasionally forage within the site, as well as only single individuals of Hen Harrier (*Circus cyaneus*) and small flocks a few small passerine species on wintering.

The composition of bird community, both in ecological and taxonomical aspect, is fully consistent with the habitat composition and ecological quality at the WPP site.

Table 7-4 Ecological Status of Bird Species at the Čibuk 2 WPP Site and Immediate Surroundings

Records:
Čibuk 1 - data from Čibuk 1 2009-2012 ESIA (Rašajski 2011, Paunović & Karapandža 2011a, b, Watts 2012, Atkins 2014) and 2018 pre-operational (Karapandža & Paunović 2018, 2019) surveys;
Čibuk 2 – data from these 2020-2022 Čibuk 2 pre-construction surveys (unless * - data from desk study, referenced in comments).

Ecological status
occurrence: R - regular, O - occasional, r - rare, i - incidental, () - locally;
abundance: H - high, M - moderate, l - low, n - negligible, () - occasionally and/or locally;
seasonality: B - breeding, M - migrating, W - wintering, R - resident, n/d - not defined, () - rarely;
habitat use: N - nesting, F - foraging, R - resting, C - commuting, p - passage only,
? - probably, () - just beyond site boundary, [] –in wider surroundings only.

Target species are highlighted

No.	Species name		Records		Ecological status				
	Scientific	English	Čibuk 1	Čibuk 2	occurrence	abundance	seasonality	habitat use	comment
1	*Coturnix coturnix*	Common Quail	+	+	R	M	B,M	N,F,R	
2	*Phasianus colchicus*	Common Pheasant	+	+	R	M	R	N,F,R	
3	*Perdix perdix*	Grey Partridge	+						
4	*Anser anser*	Greylag Goose	+						
5	*Anser fabalis*	Taiga Bean Goose	+						
6	*Anser albifrons*	Greater White-fronted Goose	+						
7	*Anas platyrhynchos*	Mallard	+						
8	*Anas acuta*	Northern Pintail	+						
9	*Columba livia f. domestica*	Domestic (Feral) Pigeon	+	+	R	M-H	R	(N),F,p	
10	*Columba oenas*	Stock Dove	+						
11	*Columba palumbus*	Common Wood Pigeon	+	+	R	l/(M)*	R	(N),F,p	*larger flocks only exceptionally during winter
12	*Streptopelia turtur*	European Turtle Dove	+	+	R	l/(M)*	B,M	(N),F,p	*larger flocks only rarely during migration
13	*Streptopelia decaocto*	Eurasian Collared Dove	+	+	R	l/M*	R	(N),F,p	*non-breeding season
14	*Caprimulgus europaeus*	European Nightjar	+						
15	*Tachymarptis melba*	Alpine Swift	+						
16	*Apus apus*	Common Swift	+	+	r-O	l-M	M	F*,p	*only incidentally
17	*Cuculus canorus*	Common Cuckoo	+	+	O	n-l	B,M	(N),N?, F,R,p	
18	*Grus grus*	Common Crane	+						
19	*Ciconia nigra*	Black Stork	+						
20	*Ciconia ciconia*	White Stork	+						
21	*Nycticorax nycticorax*	Black-crowned Night Heron	+						
22	*Ardea cinerea*	Grey Heron	+						
23	*Ardea purpurea*	Purple Heron	+						
24	*Ardea alba*	Great Egret	+						

No.	Species name		Records		Ecological status				
	Scientific	English	Čibuk 1	Čibuk 2	occurrence	abundance	seasonality	habitat use	comment
25	*Microcarbo pygmaeus*	Pygmy Cormorant	+						
26	*Phalacrocorax carbo*	Great Cormorant	+						
27	*Pluvialis apricaria*	European Golden Plover	+						
28	*Vanellus vanellus*	Northern Lapwing	+	+	r	l	M	p	
29	*Calidris pugnax*	Ruff	+						
30	*Scolopax rusticola*	Eurasian Woodcock	+						
31	*Chroicocephalus ridibundus*	Black-headed Gull	+	+	r/O*	l-M	(B),M, (W)	F,p	*migration and post-breeding dispersion
32	*Larus michahellis*	Yellow-legged Gull		+	R	l-M-(H)*	B,M,W	F,p	*wintering season
33	*Larus cachinnans*	Caspian Gull	+						
34	*Chlidonias hybrida*	Whiskered Tern	+						
35	*Tyto alba*	Western Barn Owl	+						
36	*Athene noctua*	Little Owl	+	+	i	n	R	(N?),F,p	
37	*Otus scops*	Eurasian Scops Owl	+						
38	*Asio otus*	Long-eared Owl	+	+	R	l	R	N,F,p	
39	*Strix aluco*	Tawny Owl	+						
40	*Pernis apivorus*	European Honey Buzzard	+						
41	*Hieraaetus pennatus*	Booted Eagle	+						
42	*Circus aeruginosus*	Western Marsh Harrier	+	+	R	n	M	F,p	
43	*Circus cyaneus*	Hen Harrier	+	+	R	n	W,(M)	F,p	
44	*Circus macrourus*	Pallid Harrier	+						
45	*Circus pygargus*	Montagu's Harrier	+						
46	*Accipiter nisus*	Eurasian Sparrowhawk	+						
47	*Accipiter gentilis*	Northern Goshawk	+						
48	*Haliaeetus albicilla*	White-tailed Eagle	+						
49	*Milvus migrans*	Black Kite	+						
50	*Buteo lagopus*	Rough-legged Buzzard	+						
51	*Buteo buteo*	Common Buzzard	+	+	R	l-(M)	R	(N),F,R,p	
52	*Upupa epops*	Eurasian Hoopoe	+						
53	*Merops apiaster*	European Bee-eater	+	+	r/(R)*	M	B,M	N*,F*, R*,p	*SW margin
54	*Coracias garrulus*	European Roller	+	+	i	n	B,M	p	
55	*Alcedo atthis*	Common Kingfisher	+						
56	*Jynx torquilla*	Eurasian Wryneck	+						
57	*Picus viridis*	European Green Woodpecker	+						

No.	Species name		Records		Ecological status				
	Scientific	English	Čibuk 1	Čibuk 2	occurrence	abundance	seasonality	habitat use	comment
58	*Dryobates minor*	Lesser Spotted Woodpecker	+						
59	*Dendrocoptes medius*	Middle Spotted Woodpecker	+						
60	*Dendrocopos syriacus*	Syrian Woodpecker	+						
61	*Dendrocopos major*	Great Spotted Woodpecker	+						
62	*Falco tinnunculus*	Common Kestrel	+	+	R	l-(M)	R	N,F,R	
63	*Falco vespertinus*	Red-footed Falcon	+						
64	*Falco columbarius*	Merlin	+						
65	*Falco subbuteo*	Eurasian Hobby	+						
66	*Falco cherrug*	Saker Falcon	+	+	i/O-R*	n/l*	W/B*	F?,R,p/F*,R*	*only N margin in May 2022.
67	*Falco peregrinus*	Peregrine Falcon	+						
68	*Lanius collurio*	Red-backed Shrike	+	+	R	M	B,(M)	N,F,R,p	
69	*Lanius minor*	Lesser Grey Shrike	+	+	r	n-(l)	M	p	
70	*Lanius excubitor*	Great Grey Shrike	+	+	r	n	M,W	F,p	
71	*Oriolus oriolus*	Eurasian Golden Oriole	+	+	r	n-l	M,(B)	(N),p	
72	*Garrulus glandarius*	Eurasian Jay	+						
73	*Pica pica*	Eurasian Magpie	+	+	R	l-M	R	N,F,p	
74	*Coloeus monedula*	Western Jackdaw	+	+	R	l-M	R	(N?),F,p	
75	*Corvus frugilegus*	Rook	+	+	R	l-(M)*	R	(N),F,p	*larger flocks only occasionally in non-breeding season, mostly E margin
76	*Corvus corax*	Northern Raven	+	+	R	l-M	R	N,F,p	
77	*Corvus cornix*	Hooded Crow	+	+	R	l-M	R	N,F,p	
78	*Poecile palustris*	Marsh Tit	+						
79	*Periparus ater*	Coal Tit	+						
80	*Parus major*	Great Tit	+	+	R	l-(M)	M,(W)	[N],(N?),F,p	
81	*Cyanistes caeruleus*	Eurasian Blue Tit	+	+	O	l-(M)	M,(W)	(N?),F,p	
82	*Remiz pendulinus*	Eurasian Penduline Tit	+						
83	*Riparia riparia*	Sand Martin	+	+	O/(R)*	M	M,B*	N*,F*,p	*SW margin
84	*Ptyonoprogne rupestris*	Eurasian Crag Martin	+						
85	*Hirundo rustica*	Barn Swallow	+	+	R	(l)-M	B,M	N,F,p	
86	*Delichon urbicum*	Common House Martin	+	+	O	l-M	M,(B)	[N],F,p	
87	*Aegithalos caudatus*	Long-tailed Tit	+	+	i	n-l	M	F?,p	
88	*Calandrella brachydactyla*	Greater Short-toed Lark	+	+	(i)*	(n-l)*	B,(M)	p	*only E margin
89	*Galerida cristata*	Crested Lark	+	+	O/(R)*	l-M	R	N*,F,p	*W margin

No.	Species name		Records		Ecological status				
	Scientific	English	Čibuk 1	Čibuk 2	occurrence	abundance	seasonality	habitat use	comment
90	*Lullula arborea*	Woodlark	+	+	i	n-l	M	p	
91	*Alauda arvensis*	Eurasian Skylark	+	+	R	l-M-(H)*	B,M	N,F,p	*breeding season
92	*Acrocephalus schoenobaenus*	Sedge Warbler		+	r	n-l	M	F,p	
93	*Acrocephalus palustris*	Marsh Warbler	+	+	i	n-l	M	F,p	
94	*Acrocephalus arundinaceus*	Great Reed Warbler	+	+	i/(R)*	n-(l)*	B,(M)	N*,F*,p	*particular irrigation canals with reed
95	*Hippolais icterina*	Icterine Warbler	+	+	r	n-l	M	F?,p	
96	*Phylloscopus trochilus*	Willow Warbler	+	+	r	n-l	M	F?,p	
97	*Phylloscopus collybita*	Common Chiffchaff	+	+	O	n-l	M	F?,p	
98	*Phylloscopus sibilatrix*	Wood Warbler	+						
99	*Sylvia atricapilla*	Eurasian Blackcap	+	+	O	l	M,(B)	(N),F,p	
100	*Sylvia borin*	Garden Warbler		+	i	n-l	M	F?,p	
101	*Curruca communis*	Common Whitethroat	+	+	R	M	B,M	N,F,p	
102	*Curruca curruca*	Lesser Whitethroat	+	+	i	n-l	M	F?,p	
103	*Curruca nisoria*	Barred Warbler	+	+	O	l	B,M	F,p	
104	*Regulus regulus*	Goldcrest		+	i-r	n-l	M	F?,p	
105	*Regulus ignicapilla*	Common Firecrest		+	i	n	M	F?,p	
106	*Troglodytes troglodytes*	Eurasian Wren	+	+	i-r	n-l	M	F?,p	
107	*Sitta europaea*	Eurasian Nuthatch	+						
108	*Pastor roseus*	Rosy Starling	+	+*	i	n	n/d	p	Popović 2020
109	*Sturnus vulgaris*	Common Starling	+	+	R	l-M	B,M,(W)	(N),F,p	
110	*Turdus merula*	Common Blackbird	+						
111	*Turdus pilaris*	Fieldfare	+	+	O	l-M	W,(M)	F,R,p	
112	*Turdus iliacus*	Redwing	+						
113	*Turdus philomelos*	Song Thrush	+						
114	*Turdus viscivorus*	Mistle Thrush	+	+	r	l-(M)	M,(W)	F,p	
115	*Erithacus rubecula*	European Robin	+	+	i	n-l	M	(N),p	
116	*Luscinia megarhynchos*	Common Nightingale	+	+	R	l-M	B,M	N,F,p	
117	*Phoenicurus ochruros*	Black Redstart	+	+	r	n	M,(W)	(N?),F,p	
118	*Saxicola rubetra*	Whinchat	+	+	O	l	B,M	(N?),F,p	
119	*Saxicola rubicola*	European Stonechat	+	+	R/O*	M/l*	B,M,(W)	N,F,p	*wintering season
120	*Oenanthe oenanthe*	Northern Wheatear	+	+	i	n-l	M	p	
121	*Muscicapa striata*	Spotted Flycatcher	+	+	O	l	M	F,p	
122	*Ficedula albicollis*	Collared Flycatcher		+	i	n	M	p	
123	*Passer domesticus*	House Sparrow	+	+	O/R*	l/(l-M)*	R	(N),F,p	*non-breeding season
124	*Passer montanus*	Eurasian Tree Sparrow	+	+	O/R*	l-M	R	(N),F,p	*non-breeding season

No.	Species name – Scientific	English	Records – Čibuk 1	Records – Čibuk 2	Ecological status – occurrence	abundance	seasonality	habitat use	comment
125	*Prunella modularis*	Dunnock	+	+	i	n-l	M	p	
126	*Motacilla alba*	White Wagtail	+	+	i/O*	n/(n-l)*	M,(B)	p	*migration season
127	*Motacilla flava*	Western Yellow Wagtail	+	+	R	l-(M)	B,M	N*,F,p	*by particular irrigation canals
128	*Anthus campestris*	Tawny Pipit	+	+	R	M	B,M	N,F,p	
129	*Anthus trivialis*	Tree Pipit	+	+	O	l	M	F,R,p	
130	*Anthus pratensis*	Meadow Pipit	+	+	O	l	M,(W)	F,R,p	
131	*Anthus spinoletta*	Water Pipit	+	+	r/(O)*	l-M	W,M	F,p	*SE margin
132	*Fringilla coelebs*	Common Chaffinch	+	+	O-R	(l)-M	W,M	(N),F,R,p	larger wintering flocks only exceptionally
133	*Fringilla montifringilla*	Brambling	+	+	O	l-(M)	M,(W)	F,R,p	larger wintering flocks only exceptionally
134	*Serinus serinus*	European Serin	+	+	r-O	l	M	F,R,p	
135	*Chloris chloris*	European Greenfinch	+	+	R	l-M/(M-H)*	B,M,W	(N),F,R,p	*non-breeding season
136	*Spinus spinus*	Eurasian Siskin	+	+	r/O*	l/(l-M)*	M,(W)	F,p	*migration season
137	*Carduelis carduelis*	European Goldfinch	+	+	O/R*	l/(M-H)*	M,W,(B)	(N?),F,R,p	*non-breeding season
138	*Linaria cannabina*	Common Linnet	+	+	R	M-H	M,W	F,R,p	large wintering flocks regularly
139	*Loxia curvirostra*	Red Crossbill	+						
140	*Pyrrhula pyrrhula*	Eurasian Bullfinch	+						
141	*Coccothraustes coccothraustes*	Hawfinch	+	+	O	l	M	F,R,p	
142	*Emberiza calandra*	Corn Bunting	+	+	R	l-M	B,M	(N?),F,R,p	
143	*Emberiza citrinella*	Yellowhammer	+	+	R	l-M-(H)*	W,(M)	F,R,p	*larger wintering flocks only exceptionally
144	*Emberiza hortulana*	Ortolan Bunting	+						
145	*Emberiza melanocephala*	Black-headed Bunting	+	+	r	n	B	(N?),p	
146	*Emberiza schoeniclus*	Common Reed Bunting	+	+	i/R*	n/(l-M)*	(B),W,M	(N?),F,R,p	*non-breeding season
		Total number of species	**140**	**86**					
		Number of target species	**37**	**9**					

7.3.5.3 Nature Conservation Evaluation

76 species (including all 9 target species), out of a total of 86 species recorded at the Čibuk 2 WPP site and immediate surroundings were identified as **of conservation concern**.

The assessment of the nature conservation value of the occurring bird populations and their habitats within the WPP site and immediate surroundings was undertaken for all species of conservation concern and is presented in Table 7-5.

Populations of **8 species** (including 2 target species highlighted), were assessed as being of **significant** nature conservation value. These are: *breeding/resident* populations of Common Quail (*Coturnix coturnix*), European Turtle Dove (*Streptopelia turtur*), Common Kestrel (*Falco tinnunculus*), European Stonechat (*Saxicola rubicola*), and Tawny Pipit (*Anthus campestris*), as well as *wintering* populations of Hen Harrier (*Circus cyaneus*), Water Pipit (*Anthus spinoletta*), and European Goldfinch (C*arduelis carduelis*), and *migrating* population of European Turtle Dove (*Streptopelia turtur*).

Due to the distance from the proposed site, the habitats impacted and the type of development only the immediately adjacent IBA is considered against impacts of IBA species. Adjacent IBA notified species recorded are European Turtle Dove (*Streptopelia turtur*), Red-backed Shrike (*Lanius collurio*). Barred Warbler (*Curruca nisoria*).

Only as a ***maximum precaution***, resident population of Saker Falcon (*Falco cherrug*) would also be assessed as being of significant nature conservation value if a single pair chooses to occupy a new home range that would marginally include the WPP site north edge as indicated (see section 7.3.5.1.4). Since the species is globally threatened, if the new home range will be established, even a single pair would be considered by far the most valued fauna population at the site.

Habitats of the occurring populations within the WPP site boundary were assessed as of nature conservation value at the **local** level at the most (i.e. only for the present individuals), and **not significant**.

The nature conservation evaluation undertaken here is directly comparable with the evaluation undertaken following the Čibuk 1 pre-operational surveys (Karapandža & Paunović 2019) as the same terminology and criteria were used in both. However, the two sites are clearly spatially and ecologically distinct and their bird communities significantly different (as elaborated in sections 7.3.5.1 and 7.3.5.2). As a consequence, the evaluation of the Čibuk 1 surveys is not immediately relevant to this Čibuk 2 ESIA, except for comparison of the two sites. Similar to the strictly faunistic aspect (as elaborated in section 7.3.5.1), the nature conservation value of the Čibuk 1 site bird fauna is significantly greater, since populations of as many as 23 species occurring at the Čibuk 1 site were assessed as being of significant conservation value.

Table 7-5 Nature Conservation Value of Populations and Habitats of Bird Species of Conservation Concern at the Čibuk 2 WPP Site and Immediate Surroundings

No. in column 1 - same as in

Table 7-4, for convenience;

Population / Habitats - rating and scale of nature conservation value assessed on the basis of species' population abundance (Table 7-1, Table 7-2) and ecological status (

Table 7-4) within the site, and encompassing population size and conservation status (Appendix C); populations and habitats valued at the regional level or higher are considered to be of significant conservation value (**blue**) ;
rating (grade) of conservation value: major, moderate, minor, negligible, no;
scale (level) of conservation value: local (municipal), regional (South Banat), national (Serbia), European, global;
() - at the most;
bold and ***bolditalic*** refer to particular habitat types/elements and/or populations marked accordingly in the Justification column;

Justification- summarised, complete data and references are provided in tables and text above and Appendix C.

Target species are highlighted

No.	Species name	Population	Habitats	Justification
1	*Coturnix coturnix* Common Quail	**minor regional**	major local	Abundant and relatively large local breeding population (= up to 5% of regional) nests and forages in farmland across the site.
12	*Streptopelia turtur* European Turtle Dove	**moderate regional** / ***minor regional***	moderate local	Single individuals of small population (a few pairs max, VU) **nesting** just beyond the site boundary regularly forage within the site, as well as small ***migrating*** flocks (= up to 1% regional breeding population, VU) rarely.
16	*Apus apus* Common Swift	negligible	negligible	Occasional passage and incidental foraging of small migrating flocks (= up to 1% of regional breeding population).
17	*Cuculus canorus* Common Cuckoo	minor local	(minor local)	Single individuals of small population (a few pairs max), nesting just beyond the site boundary (possibly also within occasionally), occasionally forage within the site.
36	*Athene noctua* Little Owl	negligible	negligible	Only incidental passage and possible foraging of single individuals nesting in site surroundings.
34	*Asio otus* Long-eared Owl	minor local	(minor local)	4 pairs (= up to 0.2% of regional population) nest in **woodland/scrub fragments** and **elements** within the site and in immediate surroundings, and occasionally forage across the site.
42	*Circus aeruginosus* Western Marsh Harrier	negligible	negligible	Single migrating individuals (= up to 0.6% of regional population) regularly in passage, and occasionally forage, across the site.
43	*Circus cyaneus* Hen Harrier	**moderate national**	minor local	Single wintering individuals (= up to 0.5% of national population, VU) regularly in passage, and occasionally forage, across the site.
51	*Buteo buteo* Common Buzzard	major local	moderate local	2 resident pairs (= up to 0.9% of regional population) nesting just beyond the site boundaries, regularly forage across the site.
53	*Merops apiaster* European Bee-eater	moderate local	**moderate local** / negligible	Small colonies (= up to 0.7% of regional population) nest in **loess faces** at the site boundary and regularly forage on **site margins**, only rarely elsewhere.
54	*Coracias garrulus* European Roller	negligible	no	Only incidental passage of single individuals.
62	*Falco tinnunculus* Common Kestrel	**minor regional**	**major local** / moderate local	7 pairs (= up to 1.4% of regional resident population), nest in **woodland/scrub fragments** and **elements** and on **OHL pylons** within the site and in immediate surroundings, and regularly forage across the site.
66	*Falco cherrug* Saker Falcon	negligible (*precautionary* major national)	negligible (*precautionary* **major local** / negligible)	Only incidental passage of single individuals in winter (<1% of regional wintering population, CR). Maximum *precaution* may be justified because of indication that a new home range could be established on north site margin, whilst even a single pair constitutes ca. 6% of national breeding population (CR). The new pair

No.	Species name	Population	Habitats	Justification
				would be expected to nest on **OHL pylons** in site immediate surroundings (highly unlikely within), and regularly **forage beyond the site boundaries** (outskirts of villages), only passing within the site (northeast margin).
68	*Lanius collurio* Red-backed Shrike	major local	**major local** / moderate local	Small population (= up to 0.9% of regional) nests in **scrub fragments** and **elements** and forages across the site.
70	*Lanius excubitor* Great Grey Shrike	negligible	negligible	Only rare passage and incidental foraging of single migrating and wintering individuals.
71	*Oriolus oriolus* Eurasian Golden Oriole	(minor local)	no	Only rare passage of single individuals within the site, almost only on migration (although nesting in immediate surroundings).
75	*Corvus frugilegus* Rook	minor local	negligible	Small flocks of local resident population, nesting in the site immediate surroundings, in regular passage and foraging, mainly on east site margin, whilst larger flocks (=up to 0.5% of regional resident population) only occasionally in non-breeding season.
80	*Parus major* Great Tit	(minor local)	(minor local)	Regular passage and foraging of single individuals and small flocks (=up to 0.1% of regional resident population) only in non-breeding season (although nesting in wider surroundings).
81	*Cyanistes caeruleus* Eurasian Blue Tit	minor local	(minor local)	Regular passage and foraging of single individuals and small flocks, (=up to 0.2% of regional resident population) only in non-breeding season (although nesting in immediate surroundings).
83	*Riparia riparia* Sand Martin	moderate local	**moderate local** / negligible	Small colonies (= up to 0.6% of regional population) nest in **loess faces** at the site boundary and regularly forage on **site margins**, only occasionally elsewhere.
85	*Hirundo rustica* Barn Swallow	minor local	minor local	Small flocks (=up to 0.2% of regional population), nesting in immediate surroundings, regularly forage across the site.
86	*Delichon urbicum* Common House Martin	(minor local)	negligible	Small flocks (=up to 0.1% of regional population) nesting in wider surroundings, occasionally forage across the site.
89	*Galerida cristata* Crested Lark	moderate local	**moderate local** / negligible	Small population (= up to 0.6% of regional population) nests and forages on **west site margin**, only occasionally elsewhere.
91	*Alauda arvensis* Eurasian Skylark	moderate local	moderate local	Abundant but relatively small local population (= up to 0.4% of regional) nests and forages in farmland across the site.
94	*Acrocephalus arundinaceus* Great Reed Warbler	(minor local)	(**minor local**) / no	Single pairs nest and forage in **reeds** in **certain canals** within the site, elsewhere only incidental passage.
99	*Sylvia atricapilla* Eurasian Blackcap	negligible	negligible	Only occasional passage and foraging of single individuals within the site, almost only on migration (although nesting in immediate surroundings).
101	*Curruca communis* Common Whitethroat	moderate local	**moderate local** / minor local	Small population (=up to 0.4% of regional) nests in **woodland/scrub fragments** and **elements** within the site and regularly forage across the site.
103	*Curruca nisoria* Barred Warbler	negligible	(negligible)	Only occasional passage and rare foraging of single migrating individuals.

No.	Species name	Population	Habitats	Justification
109	*Sturnus vulgaris* Common Starling	(minor local)	negligible	Small flocks (=up to 0.1% of regional population) nesting in immediate surroundings, regularly forage across the site, only rarely in winter.
111	*Turdus pilaris* Fieldfare	negligible	negligible	Small wintering flocks (=up to 0.2% of national population) occasionally forage and rest across the site.
114	*Turdus viscivorus* Mistle Thrush	negligible	negligible	Small migrating and wintering flocks (=up to 0.3% of national population) rarely forage across the site.
115	*Erithacus rubecula* European Robin	negligible	no	Only incidental passage of single migrating individuals within the site (although nesting in immediate surroundings).
116	*Luscinia megarhynchos* Common Nightingale	minor local	**minor local** / (minor local)	Small population (=up to 0.1% of regional population) nests in **scrub fragments** and **elements** and forages across the site.
117	*Phoenicurus ochruros* Black Redstart	negligible	(negligible)	Only incidental passage and foraging of single migrating (and wintering) individuals within the site (although probably nesting in immediate surroundings).
118	*Saxicola rubetra* Whinchat	major local	moderate local	Single individuals and pairs (= up to 0.6% of regional population), nesting in immediate surroundings, occasionally forage across the site.
119	*Saxicola rubicola* European Stonechat	**moderate regional**	**major local** / moderate local	Abundant and relatively large population (= up to 6% of regional) nests in **ruderal vegetation** along the **tracks** and **canals** and forages across the site.
121	*Muscicapa striata* Spotted Flycatcher	negligible	negligible	Only occasional passage and possible foraging of single migrating individuals.
123	*Passer domesticus* House Sparrow	negligible	negligible	Small flocks, nesting in immediate surroundings, forage across the site, regularly in non-breeding season, occasionally in breeding season.
124	*Passer montanus* Eurasian Tree Sparrow	negligible	negligible	Small flocks, nesting in immediate surroundings, forage across the site, regularly in non-breeding season, occasionally in breeding season.
126	*Motacilla alba* White Wagtail	negligible	no	Only occasional passage of single individuals on migration, otherwise only incidentally.
127	*Motacilla flava* Western Yellow Wagtail	minor local	**minor local** / (minor local)	Small population (=up to 0.1% of regional population) nests along **certain canals** and forages across the site.
128	*Anthus campestris* Tawny Pipit	**minor regional**	major local	Abundant and relatively large population (=up to 4.6% of regional) nests and forages in farmland across the site.
129	*Anthus trivialis* Tree Pipit	negligible	(negligible)	Occasional passage, and less often resting and foraging, of single migrating individuals.
130	*Anthus pratensis* Meadow Pipit	negligible	(negligible)	Occasional passage, and less often resting and foraging, of single migrating (and wintering) individuals.
131	*Anthus spinoletta* Water Pipit	**minor national**	**major local** / minor local	Small wintering (and migrating) flocks (=up to 4% of national population), occasionally forage on **southeast** site **margin**, rarely elsewhere.

No.	Species name	Population	Habitats	Justification
132	*Fringilla coelebs* Common Chaffinch	minor local	(minor local)	Small flocks (=up to 0.1% of regional breeding population) regularly forage and rest across the site in non-breeding season only (although nesting in immediate surroundings).
133	*Fringilla montifringilla* Brambling	negligible	negligible	Small flocks (=up to 0.1% of national population), occasionally forage and rest across the site on migration and wintering.
134	*Serinus serinus* European Serin	negligible	(negligible)	Single individuals occasionally forage and rest across the site exclusively on migration.
135	*Chloris chloris* European Greenfinch	major local	moderate local	Single individuals nesting in immediate surroundings, and medium to large wintering flocks (=up to 0.7% of regional breeding population), regularly forage across the site.
136	*Spinus spinus* Eurasian Siskin	minor local	(minor local)	Small migrating (and wintering) flocks occasionally forage across the site.
137	*Carduelis carduelis* European Goldfinch	(***minor local***) / **minor regional**	***negligible*** / **moderate local**	Single individuals of small population ***nesting*** in immediate surroundings occasionally forage within the site, mostly marginally. Medium to large **wintering** flocks (=up to 2.2% of regional breeding population) regularly forage and rest across the site.
138	*Linaria cannabina* Common Linnet	moderate local	moderate local	Large migrating and wintering flocks (=up to 0.5% of national population) regularly rest and forage across the site.
141	*Coccothraustes coccothraustes* Hawfinch	(minor local)	(minor local)	Single individuals and pairs (= up to 0.3% of regional breeding population), occasionally rest and forage across the site on migration.
142	*Emberiza calandra* Corn Bunting	minor local	minor local	Single individuals and pairs (= up to 0.2% of regional population), (probably) nesting in immediate surroundings, regularly rest and forage across the site.
143	*Emberiza citrinella* Yellowhammer	minor local	minor local	Small to medium wintering (and migrating) flocks (= up to 0.6% of regional breeding population), regularly rest and forage across the site.
145	*Emberiza melanocephala* Black-headed Bunting	minor local	(negligible)	Only rare passage on migration within the site (although probably nesting in immediate surroundings).
146	*Emberiza schoeniclus* Common Reed Bunting	**minor local** / negligible	**minor local** / no	Small to medium **wintering** (and migrating) flocks (=up to 0.3% of national population) regularly rest and occasionally forage across the site, whilst only incidental passage of single individuals in breeding season (although probably nesting in immediate surroundings).
ALL OTHER SECONDARY SPECIES		negligible	negligible or no	Only incidental or rare passage (and exceptionally foraging) of negligible number of individuals.

7.3.6 Bats

7.3.6.1 Survey Results

An overview of the results of the pre-construction 2020-2022 Čibuk 2 ESIA Surveys is provided in this section, as well as comparisons with previous Čibuk 1 2018 pre-operational and 2009-2012 ESIA survey results, where relevant. Full results of the 2020-2022 Čibuk 2 ESIA Surveys are provided in Appendix C, whilst those of the previous Čibuk 1 surveys are available in corresponding reports and their Appendices (Rašajski 2011, Karapandža & Paunović 2011, 2012, Karapandža & Paunović 2018, 2019). As for birds, it should be noted that Čibuk 2 and Čibuk 1 sites are clearly separated (Figure 5-5), and thus the survey area of these ESIA Surveys does not overlap with the previous Čibuk 1 surveys (except partly for Roost Surveys). The two sites differ ecologically in geomorphology, habitat composition, and location relative to surrounding designated sites and other more preserved natural habitats (Deliblato Sands in particular). Therefore, the results of Čibuk 1 bat surveys are not immediately relevant to this Čibuk 2 ESIA, except for comparison, i.e. relative evaluation of the two sites' bat interests.

A total of at least **15** bat **species** was recorded within the Čibuk 2 WPP site and immediate surroundings, all by 2020-2022 ESIA Surveys only (Table 7-7). A total of at least 18 species were recorded by 2009-2018 Čibuk 1 surveys. This difference in species richness, where Čibuk 2 site bat community is slightly poorer (as expected by the SS), confirms the ecological distinction between the two sites. All of the species which were recorded only in the Čibuk 1 site area, are associated with woodland/scrub. These species were mostly recorded only on the Čibuk 1 site east margin (or just beyond the site boundary), i.e. in the marginal area of Deliblato Sands. No current records (2011-2022) from either WPP site area were found by the desk study. Occurrence of additional species, those already recorded in the South Banat region (Table 7-7), might not be completely excluded, though only as a rare or incidental passage of single individuals, and thus not relevant for this assessment.

The 15 species recorded in the Čibuk 2 site area accounts for almost 50% of the national bat fauna, and about 63% of the regional bat fauna (Paunović *et al.* 2020, ESIA Team's data). In terms of species richness/diversity alone, the bat fauna of the Čibuk 2 site and in immediate surroundings can be evaluated as **moderately rich**.

In terms of **taxonomy**, the most numerous by far are the Vesper Bats (Vespertilionidae) with 13 species occurring. Horseshoe Bats (Rhinolophidae) and Bent-Winged Bats (Miniopteridae) are also represented, with 1 species each.

7.3.6.1.1 Bat roosting

No bat ***roosts*** were found within the Čibuk 2 WPP site. The preliminary roost assessment identified a small number of potential bat roosts, and the exhaustive surveys did not find any bat roosts. All of the buildings and trees identified during the preliminary roost assessment were found to have negligible roosting potential and none had the potential to support larger bat colonies (sections 7.3.3.3 and 7.3.3.5). Bat roosts were also not found within the Čibuk 1 WPP site, so it is concluded that the two sites are very similar in this respect.

In contrast, potential roosting features are abundant and diverse in the immediate surroundings. Numerous old trees and buildings, older and neglected in particular, offering plenty of various potential roost sites suitable for different bat species have been identified in all the surrounding settlements, including Bavanište and Mramorak villages (which is the most relevant for this assessment). A small number of potential roosts in trees was also identified within the Majur woodland fragment just beyond the site western boundary.

It is concluded that the populations of all bat species occurring at the site, except for the European Long-winged Bat (*Miniopterus schreibersii*), certainly roost in the area of the Bavanište and Mramorak villages and possibly in smaller numbers also elsewhere in the site surroundings.

7.3.6.1.2 Flight activity

During both the Čibuk 2 and previous Čibuk 1 surveys, bat flight activity was surveyed at ground level: along transects throughout the developed areas site (manual Transect Surveys), and at selected WTG locations (Automated Surveys). The quantitative overview of the overall flight activity from the Čibuk 2 surveys in 2021 activity season is provided in

Table 7-6, the spatial distribution of activity is presented in Figure 7-23, and temporal in and Figure 7-24, whilst complete survey data are provided in Appendix C. An overview of flight activity from the Čibuk 1 2018 surveys is provided in Table 12, the spatial distribution of activity in Table 13 and Figure 15, and temporal in Table 14 and Figure 16 of the pre-operational assessment report (Karapandža & Paunović 2019), and full survey results in Appendices. An overview of flight activity from the Čibuk 1 2010 and 2011 surveys is provided in Table 15, the spatial distribution of activity in Chart 1, and temporal in Chart 2 of the corresponding survey reports (Karapandža & Paunović 2011, 2012), and full survey results in Appendices.

The flight activity of a minimum of **15 species** was recorded by the 2021 Čibuk 2 Surveys (

Table 7-6). This number is slightly lower than at the Čibuk 1 site where the activity of a minimum of 18 species was recorded. All the species recorded at the Čibuk 2 site were also recorded at the Čibuk 1, with additional 3 species: Natterer's Bat (*Myotis nattereri*), Daubenton's Bat (*Myotis daubentonii*) and Western Barbastelle Bat (*Barbastella barbastellus*) (Table 7-7). The activity of these 3 tree-roosting species was almost only recorded on the Čibuk 1 site east margin or just beyond the site boundary, i.e. in the marginal area of Deliblato Sands (only incidentally elsewhere).

The number of species is given as a minimum as certain species were considered as groups(due to inherent limitations of acoustic surveys, as elaborated in section 6.3.3.12.1.4). However, when taking in to account the species occurrence in the South Banat region (Table 7-7), the presence of suitable foraging habitats and roosting possibilities within commuting distances, more than one species from two of these groups are expected to occur: Greater Mouse eared Bat (*Myotis myotis*) and Lesser Mouse-eared Bat (*Myotis blythii*), Brown Long eared Bat (*Plecotus auritus*) and Grey Long-eared Bat (*Plecotus austriacus*). For other groups, only single species are expected to occur: Geoffroy's Bat (*Myotis emarginatus*) and Whiskered Bat (*Myotis mystacinus*). This means that the **total number of species** occurring in the Čibuk 2 area is very likely to be **17**.

Two more of the South Banat species, recorded also at the Čibuk 1 site, could possibly occur in the Čibuk 2 area: Natterer's Bat (*Myotis nattereri*) and Western Barbastelle Bat (*Barbastella barbastellus*). However, foraging habitats at the site and roosting possibilities within commuting distances are sub-optimal at the most for both these species, and thus only incidental passage of single individuals could be expected, which is not relevant for this assessment.

The remaining five of the South Banat species cannot be expected due to a lack of even sub-optimal ecological conditions in the area. These species are associated with mature woodland (*Myotis bechsteinii*), or with aquatic foraging habitats and roosts in mature woodland (*Myotis daubentonii* and *Myotis dasycneme*), or recorded in South Banat only recently and only exceptionally in very specific roosts and habitats (*Rhinolophus hipposideros* and *Rhinolophus euryale*).

Table 7-6 Overview of the Bat Flight Activity (April - November 2021) and Activity Indices

For clearer presentation, when species/group was not recorded table cells are left blank, whilst crossed-out cells indicate inapplicability.

Flight activity:

N- total number of passes (contacts) observed/recorded [n];

Activity indices:

AI - activity index, number of bat passes recorded per time unit [contacts/h];
cA - relative abundance, percentage of passes attributed to particular species/group of the total passes identifiable to the lowest applicable species/group level, corrected by species-specific detectability coefficient (Appendix C) [%].

<table>
<tr><th colspan="2">Species / group Name</th><th colspan="3">Transect Surveys</th><th colspan="3">Automated Surveys</th></tr>
<tr><th>Scientific</th><th>English</th><th>N</th><th>AI</th><th>cA</th><th>N</th><th>AI</th><th>cA</th></tr>
<tr><td>Rhinolophus ferrumequinum</td><td>Greater Horseshoe Bat</td><td>1</td><td>0.01</td><td>0.2</td><td>19</td><td>0.01</td><td>0.2</td></tr>
<tr><td>Miniopterus schreibersii</td><td>Schreiber's Bent-winged Bat</td><td>43</td><td>0.23</td><td>3.3</td><td rowspan="9">6339</td><td rowspan="9">2.11</td><td rowspan="9">69.3</td></tr>
<tr><td>Pipistrellus pygmaeus</td><td>Soprano Pipistrelle Bat</td><td>44</td><td>0.24</td><td>4.1</td></tr>
<tr><td>Pipistrellus pipistrellus</td><td>Common Pipistrelle Bat</td><td>2</td><td>0.01</td><td>0.2</td></tr>
<tr><td>Pipistrellus kuhlii</td><td>Kuhl's Pipistrelle Bat</td><td>871</td><td>4.70</td><td>66.6</td></tr>
<tr><td>Pipistrellus kuhlii/nathusii</td><td>Kuhl's/ Nathusius' Pipistrelle Bat</td><td>150</td><td>0.81</td><td>0.0</td></tr>
<tr><td>Pipistrellus nathusii</td><td>Nathusius' Pipistrelle Bat</td><td>182</td><td>0.98</td><td>13.9</td></tr>
<tr><td>Pipistrellus nathusii / Hypsugo savii</td><td>Nathusius'/ Savi's Pipistrelle Bat</td><td>1</td><td>0.01</td><td></td></tr>
<tr><td>Hypsugo savii</td><td>Savi's Pipistrelle Bat</td><td>9</td><td>0.05</td><td>0.5</td></tr>
<tr><td>Pipistrellus/Hypsugo sp.</td><td>Pipistrelle Bat</td><td>20</td><td>0.11</td><td></td></tr>
<tr><td>Myotis emarginatus</td><td>Geoffroy's Bat</td><td>1</td><td>0.01</td><td>0.2</td><td rowspan="4">76</td><td rowspan="4">0.03</td><td rowspan="4">0.8</td></tr>
<tr><td>Myotis brandtii/mystacinus</td><td>Brandt's/Whiskered Bat</td><td>5</td><td>0.03</td><td>1.2</td></tr>
<tr><td>Myotis myotis/blythii</td><td>Mouse-eared Bats</td><td>5</td><td>0.03</td><td>0.6</td></tr>
<tr><td>Plecotus sp.</td><td>Long-eared Bats</td><td>4</td><td>0.02</td><td>0.2</td></tr>
<tr><td>Eptesicus serotinus</td><td>Serotine Bat</td><td>18</td><td>0.10</td><td>1.0</td><td>58</td><td>0.02</td><td>0.6</td></tr>
<tr><td>Vespertilio murinus</td><td>Parti-coloured Bat</td><td>33</td><td>0.18</td><td>1.5</td><td rowspan="4">1840</td><td rowspan="4">0.61</td><td rowspan="4">20.1</td></tr>
<tr><td>Nyctalus leisleri</td><td>Leisler’s Bat</td><td>37</td><td>0.20</td><td>1.1</td></tr>
<tr><td>Nyctalus noctula/leisleri</td><td>Noctule/ Leisler’s Bat</td><td>7</td><td>0.04</td><td></td></tr>
<tr><td>Nyctalus noctula</td><td>Noctule Bat</td><td>238</td><td>1.28</td><td>5.5</td></tr>
<tr><td>Eptesicus/Vespertilio/Nyctalus sp.</td><td>Nyctaloid</td><td>24</td><td>0.13</td><td></td><td rowspan="2">813</td><td rowspan="2">0.27</td><td rowspan="2">8.9</td></tr>
<tr><td>Chiroptera indet.</td><td>unidentified bat</td><td>9</td><td>0.05</td><td></td></tr>
<tr><td colspan="2">Total</td><td>1704</td><td>9.19</td><td>100.0</td><td>9145</td><td>3.04</td><td>100.0</td></tr>
<tr><td colspan="2">Total duration of survey (h)</td><td colspan="3">111.0</td><td colspan="3">2761.4</td></tr>
</table>

The Čibuk 2 WPP site bat community is characterised by dominance of a single species, the Kuhl’s Pipistrelle Bat (Pipistrellus kuhlii), , the only species with non-negligible overall activity. A distinct dominance of single species is a measure of low diversity in quantitative terms. Only a few more species occur with (almost) non-negligible abundance: Noctule Bat (Nyctalus noctula) and Nathusius’ Pipistrelle Bat (Pipistrellus nathusii). The overall activity of all other species is negligible and their abundance negligible or low. In this respect, Čibuk 2 site bat community is similar to that of the Čibuk 1 site, although the dominance of the Kuhl’s Pipistrelle Bat is less pronounced there, and two more species are considered subdominant. This means that the Čibuk 2 site bat community is also slightly poorer in terms of the quantitative composition/ diversity.

The overall recorded bat activity at the Čibuk 2 site is moderate on transects and low at WTG locations, which does not indicate a high importance of the Čibuk 2 site for the local bat community. In contrast, the overall activity at the Čibuk 1 site is significantly higher, high both on transects and at WTG locations. This clearly indicates that the Čibuk 2 site as whole has significantly lower importance for the local bats than Čibuk 1 site.

It should also be noted that activity many times higher than within the Čibuk 2 site was also recorded (during the Roost Surveys) in the areas of surrounding settlements and certain woodland, scrub and marshland in the immediate site surroundings.

However, the activity is not evenly distributed in space (Figure 7-23) and time (Figure 7-24), so occasionally and/or locally, most species were recorded with significantly higher activity, whilst certain indicative spatial and/or temporal patterns can be identified.

The activity Index (with the share of foraging activity) of the most abundant bat species/ groups per transects and surveyed WTGs (April – November 2021) is provided in figure below.

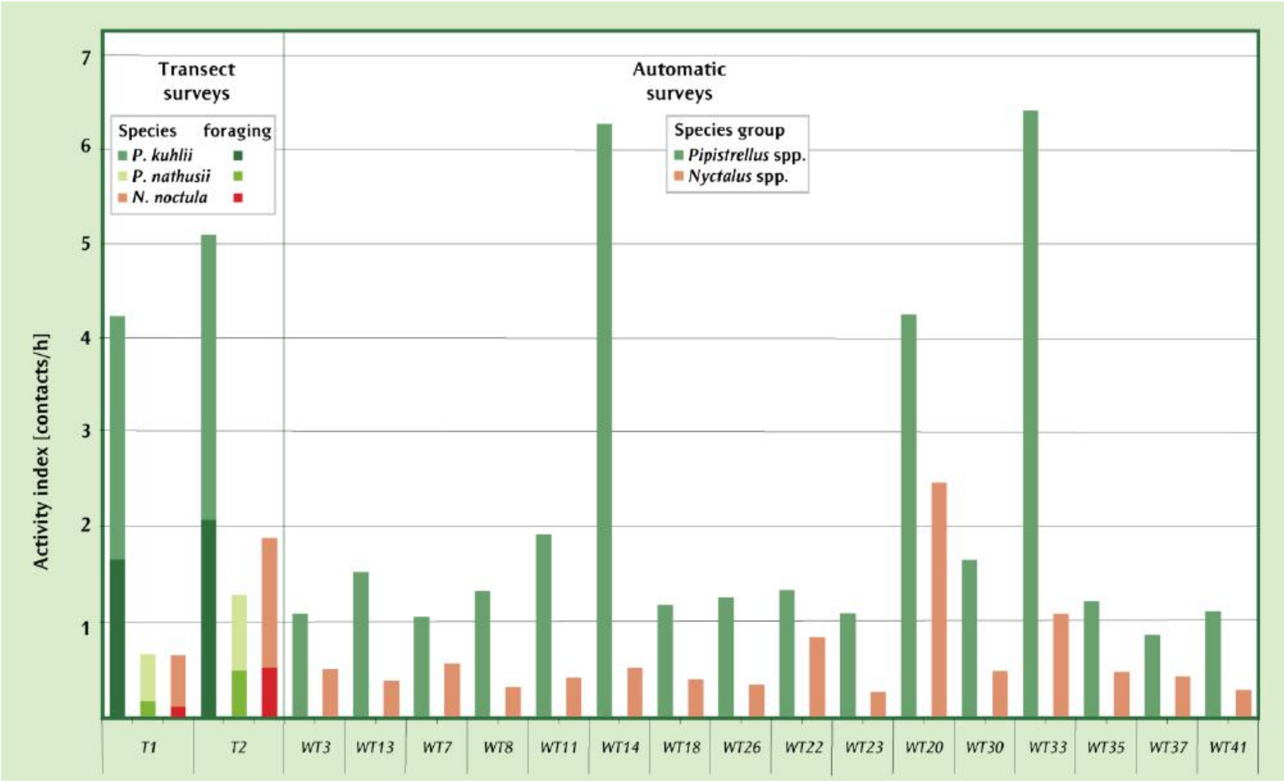

Figure 7-23 Activity Index of the Most Abundant Bat Species/Groups per Transects and Surveyed WTGs

This data indicates that overall bat activity is significantly higher (and high) at T2 compared to T1 (where it is moderate). This difference is pronounced in most species, and in particular in Noctule Bat (*Nyctalus noctula*), Nathusius' Pipistrelle Bat (*Pipistrellus nathusii*), Soprano Pipistrelle Bat (*Pipistrellus pygmaeus*), Leisler's Bat (*Nyctalus leisleri*), and Serotine Bat (*Eptesicus serotinus*), as well as in Whiskered Bat (*Myotis mystacinus*), Mouse-eared Bat(s) (*Myotis myotis/blythii*) and Savi's Pipistrelle Bat (*Hypsugo savii*), whose (almost) entire activity is recorded at T2. In Nathusius' Pipistrelle Bat, Noctule Bat and Leisler's Bat this is accompanied by a significantly higher share of foraging activity recorded at T2.

The overall and foraging activity of Noctule Bat (Nyctalus noctula) and Leisler's Bat (Nyctalus leisleri) is further focused within T2, and many times higher along the easternmost part than elsewhere. This is in line with the findings of Automated Surveys, with many times higher activity of the corresponding species group recorded at WTGs located in this area (WT20, WT33 and WT22) than elsewhere. Daily activity of the Noctule Bat also begins earlier there than elsewhere, it reaches its maximum almost immediately, with clear unidirectionality of flights from the Mramorak village area towards the site, and almost absent foraging activity at the beginning of daily activity. The same characteristics of the Noctule Bat daily activity, although with significantly lower recorded activity, are also recorded on parts of both transects closest to the Bavanište village.

The spatial focus of activity of all Pipistrelle Bat species (Pipistrellus/Hypsugo spp.) is recorded within both T1 and T2 along particular segments of certain rough tracks and canals, mostly where linear woodland/scrub is present along the tracks/canals. This is the most pronounced in the southeast part of T2, as well as at WTGs located in this area (WT20 and WT33), and also on parts of both transects closest to the Mramorak and Bavanište village areas. These are also the areas where foraging activity of these species is focused. Closer to the villages, daily activity of Kuhl's Pipistrelle Bat (Pipistrellus kuhlii) and Nathusius' Pipistrelle Bat (Pipistrellus nathusii), for which there is sufficient data to draw such conclusions, shows certain indicative patterns. The daily activity of these two species regularly begins earlier there than elsewhere and reaches its maximum almost immediately, with clear unidirectionality of flights from the village areas towards the site at the beginning of daily activity and spatial focus of flights along certain tracks, as well as lasts longer than elsewhere. In all remaining areas of the site, the activity of Pipistrelle Bat species is absent at the beginning of daily activity and reaches its full intensity gradually and only later during the night, without unidirectionality of flights. It should be noted that the significantly higher overall activity of Pipistrelle Bat species at WT14 than at most other WTGs is not indicative because it is a result of almost continuous foraging activity of a few individuals recorded during only one night in October (Appendix C). During this night intensive works of agricultural machinery with use of lighting took place in this area. If the results from this night are disregarded, the overall activity at this WTG is low and similar as at most other surveyed WTGs.

Social calls were recorded very rarely (Appendix C), none that would be indicative of display territories/roosts.

Occurrence of migratory flocks was not recorded.

The activity Index of the most abundant bat species/ groups per months (April – November 2021) is provided in figure below.

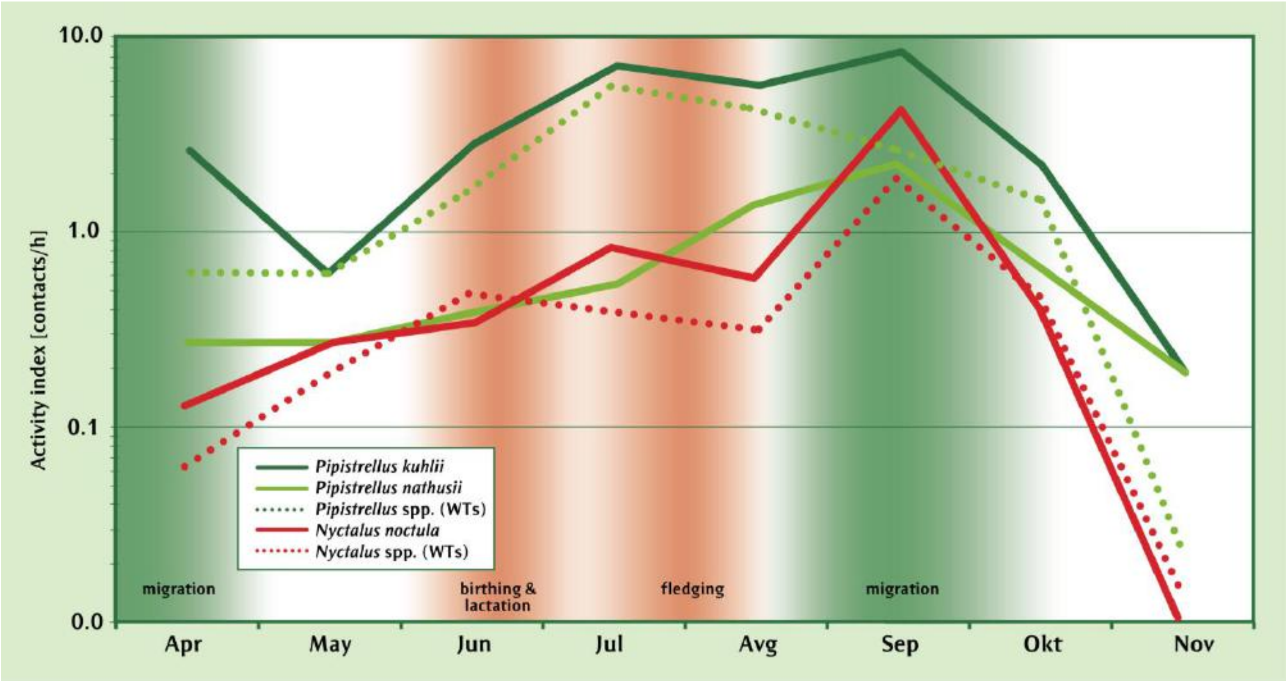

Figure 7-24 Activity Index of the Most Abundant Species/Groups by Months in 2021

Seasonal activity patterns indicative of migratory influx and wintering in the area were identified in Noctule Bat (*Nyctalus noctula*), Leisler's Bat (*Nyctalus leisleri*) and, to a lesser extent, Nathusius' Pipistrelle Bat (*Pipistrellus nathusii*), whose resident populations are also present within the site. The migratory influx is also evident in Parti-coloured Bat (*Vespertilio murinus*) and Soprano Pipistrelle Bat (*Pipistrellus pygmaeus*), whose only migratory populations are present within the site. All these species are long-distance migrants, whose migratory populations hibernate in the region (Dietz et al. 2009, Paunović et al. 2011, 2020), and these findings are expected.

Seasonal activity patterns indicative of migratory flow (and/or vagrancy), though not of the wintering in the area, were clearly found in Schreiber's Bent-winged Bat (*Miniopterus schreibersii*), a medium-distance migrant whose population both breeds and hibernates in the region, but seasonally changes roosts (Dietz *et al.* 2009, Paunović *et al.* 2011, 2020).

In contrast, seasonal activity patterns which are likely indicative of autumn migratory efflux were found in *Myotis* spp. and Long-Eared Bats (*Plecotus* spp.), though all these species are recorded too infrequently to draw definite conclusions. However, this would be typical of these species that gather in large numbers from a wider area in certain, usually underground, roost where they swarm, mate and/or hibernate (Dietz et al. 2009, Paunović et al. 2011, 2020).

Seasonal activity patterns indicate also reproductive (nursing) activity within the occurring populations of (*Pipistrellus kuhlii*), Nathusius' Pipistrelle Bat (*Pipistrellus nathusii*), and Noctule Bat (*Nyctalus noctula*).These species are known to be either strictly resident or having resident populations breeding in the region (Dietz *et al.* 2009, Paunović *et al.* 2011, 2020).

7.3.6.2 Ecological Status

The ecological status within the Čibuk 2 WPP site boundary and immediate surroundings, was assessed for all 24 bat species recorded in the South Banat region and is presented in Table 7-7, whilst ecological functions of the site area for bats (i.e. bat habitat use) are presented in Figure 7-25.

Table 7-7 Ecological Status of Bat Species at the Čibuk 2 WPP Site and Immediate Surroundings

Records

Region - South Banat (Paunović *et al.*2020, ESIA Team's data) ;
Čibuk 1 - data from Čibuk 1 2009-2012 ESIA (Rašajski 2011, , Karapandža & Paunović 2011, 2012) and 2018 pre-operational (Karapandža & Paunović 2018, 2019) surveys;
Čibuk 2 – data from these 2020-2022 Čibuk 2 pre-construction surveys.

Ecological status

occurrence: R - regular, O - occasional, r - rare, i - incidental, () - locally;
activity/abundance: V - very high, H - high, M - moderate, l - low, n - negligible, () - occasionally and/or locally;
migratory status: R - resident, M - migratory, n/d - undetermined;
habitat use: R - roost (s), F - foraging area(s), C - commuting route(s),
? - probably, () - just beyond site boundary, [] –in wider surroundings only.

Species name		Records			Ecological status					Comment
Scientific	English	Region	Čibuk 1	Čibuk 2	occurrence	activity	abundance	migratory status	habitat use	
Rhinolophus hipposideros	Lesser Horseshoe Bat	+			not expected					
Rhinolophus euryale	Mediterranean Horseshoe Bat	+			not expected					
Rhinolophus ferrumequinum	Greater Horseshoe Bat	+	+	+	i	n	n	R	(R?),F?,C?	
Miniopterus schreibersii	Schreiber's Bent-winged Bat	+	+	+	i/R*	n/ (n-M)*	n/ (L-M)*	M	[R],F*,C*	*migration season
Pipistrellus pygmaeus	Soprano Pipistrelle Bat	+	+	+	i/R*	n/ (n-H)*	n/ (L-M)*	M	(R?)*, F*,C*	*migration (& wintering) season
Pipistrellus pipistrellus	Common Pipistrelle Bat	+	+	+	i	n	n	R	(R?),F?,C?	
Pipistrellus kuhlii	Kuhl's Pipistrelle Bat	+	+	+	R	l-M-(V)*	V	R	(R),F,C	*certain tracks
Pipistrellus nathusii	Nathusius' Pipistrelle Bat	+	+	+	R	n-l-(V)*	H	R+(M)	(R),F,C	*certain tracks
Hypsugo savii	Savi's Pipistrelle Bat	+	+	+	O	n-(M)*	n-L	R	(R),F,C	*certain tracks
Myotis emarginatus	Geoffroy's Bat	+	+	+	i	n	n	R	(R?),F?,C?	
Myotis bechsteinii	Bechstein's Bat	+			not expected					
Myotis nattereri	Natterer's Bat	+	+		could occur incidentally					
Myotis mystacinus	Whiskered Bat	+	+	very likely all of the bellow belongs to this species						
M. brandtii/mystacinus	Brandt's/Whiskered Bat		+	+	(r)*	(n)*	(n-L)*	R	(R?),F*,C*	*only E margin
Myotis daubentonii	Daubenton's Bat	+	+		not expected					
Myotis dasycneme	Pond Bat	+			not expected					
Myotis blythii	Lesser Mouse-eared Bat	+		bellow may belong to any or both of these species						

Species name		Records			Ecological status					Comment
Scientific	English	Region	Čibuk 1	Čibuk 2	occurrence	activity	abundance	migratory status	habitat use	
Myotis myotis	Greater Mouse-eared Bat	+								
M myotis/blythii	Mouse-eared Bats		+	+	(r)*	(n)*	(n-L)*	R	(R?),F*,C*	*only certain tracks
Barbastella barbastellus	Western Barbastelle Bat	+	+		could occur incidentally					
Plecotus auritus	Brown Long-eared Bat	+		bellow may belong to any or both of these species						
Plecotus austriacus	Grey Long-eared Bat	+								
Plecotus sp.	Long-eared Bats		+	+	(i)*	(n)*	(n-L)*	R	(R?),F?,C*	only E&S margin
Eptesicus serotinus	Serotine Bat	+	+	+	O	n/ (n-l)*	n-L/ (n-M)*	R	(R),F,C	*E margin
Vespertilio murinus	Parti-coloured Bat	+	+	+	i/(R)*	n/ (n-M)*	n/ (n-M)*	(R)+M	(R)*,F*,C*	*migration (& wintering) season
Nyctalus leisleri	Leisler's Bat	+	+	+	O/R*	n/ (n-H)*	n-L/ (n-M)*	R+M	(R),F,C	*migration (& wintering) season
Nyctalus noctula	Noctule Bat	+	+	+	R	n-(l)*/ (l-H*)**	L-M-(V)*	R+M	(R),F,C	*E part **migration (& wintering) season
Total (minimum) number of species		**24**	**18**	**15**	**24**					

Only **3 species** regularly occur **across** the WPP site: Kuhl's Pipistrelle Bat (*Pipistrellus kuhlii*), Nathusius' Pipistrelle Bat (*Pipistrellus nathusii*), and Noctule Bat (*Nyctalus noctula*). Besides these, only **6** more **species** occur at least occasionally or locally with **non-negligible activity**: Schreiber's Bent-winged Bat (*Miniopterus schreibersii*), Soprano Pipistrelle Bat (*Pipistrellus pygmaeus*), Savi's Pipistrelle Bat *Hypsugo savii*), Serotine Bat (*Eptesicus serotinus*), and Parti-coloured Bat (*Vespertilio murinus*), and Leisler's Bat (*Nyctalus leisleri*). All other species occur at the site with negligible activity, some of them only on-site margins. This means that neither their populations nor their foraging areas and commuting routes in the area are of any importance.

Most of the occurring species are sedentary and their populations **resident**. Almost only **migratory** populations of the Schreiber's Bent-winged Bat (*Miniopterus schreibersii*), Soprano Pipistrelle Bat (*Pipistrellus pygmaeus*) and Parti-coloured Bat (*Vespertilio murinus*) occur at the site. Both **resident and migratory** populations of the Nathusius' Pipistrelle Bat (*Pipistrellus nathusii*), Noctule Bat (*Nyctalus noctula*), and Leisler's Bat (*Nyctalus leisleri*) are present.

Based on the findings of Roost Survey (in site surroundings) and recorded activity, the size of populations using the site was estimated. It should be noted that the populations of all species using the site constitute only a small fraction of their populations roosting in the immediate surroundings. The estimated size of resident populations ranges from 50-100 adult individuals for the most abundant species, the Kuhl's Pipistrelle Bat (Pipistrellus kuhlii), followed by the Nathusius' Pipistrelle Bat (Pipistrellus nathusii) and Noctule Bat (Nyctalus noctula) with 10-15 individuals each, whilst all other species are represented by only a few individuals (1-5). The migratory population of the Noctule Bat is two to three times larger than the resident population of the species using the site (30-50 individuals), the Leisler's Bat's is up to twice as large as the resident (5-10), and the Nathusius' Pipistrelle Bat's is of a similar size as the resident population (10-20). Strictly migratory populations of Schreiber's Bent-winged Bat, Soprano Pipistrelle Bat, and Parti-coloured Bat are 5-10 adult individuals each.

All of the **15 (17)** occurring **species use** the site and immediate surroundings for **foraging** and **commuting**. However, only **8 species** have the least important **foraging areas** and **commuting routes** within the WPP site: Kuhl's Pipistrelle Bat (*Pipistrellus kuhlii*), Nathusius' Pipistrelle Bat (*Pipistrellus nathusii*), Soprano Pipistrelle Bat (*Pipistrellus pygmaeus*), Savi's Pipistrelle Bat *Hypsugo savii*), Noctule Bat (*Nyctalus noctula*), Leisler's Bat (*Nyctalus leisleri*), Parti-coloured Bat (*Vespertilio murinus*), and Schreiber's Bent-winged Bat (*Miniopterus schreibersii*). The most important foraging areas at the site for Pipistrelle Bats (*Pipistrellus/Hypsugo* spp.) are certain tracks, whilst for *Nyctalus* spp. it is the area in the east part (Figure 7-25). The foraging areas are not strictly spatially defined for Parti-coloured Bat and Schreiber's Bent-winged Bat as they use the entire farmland, which is also a less important foraging area for all other species. By far more and more important foraging areas and commuting routes of all species are located beyond the site boundary, in particular in the areas of surrounding settlements.

There are ***no*** bat ***roosts*** within the WPP site, whilst most of the individuals occurring within the site roost in the areas of Mramorak and Bavanište villages and/or possibly other surroundings.

The WPP site is not situated within any recognised bat ***migration routes***, whilst the known migration routes in the region follow the Danube and Tamiš valleys (see section 7.3.2). The occurrence of migratory flocks was neither recorded nor expected.

The composition of bat community and bat habitat use is fully consistent with the habitat composition and ecological quality at the WPP site.

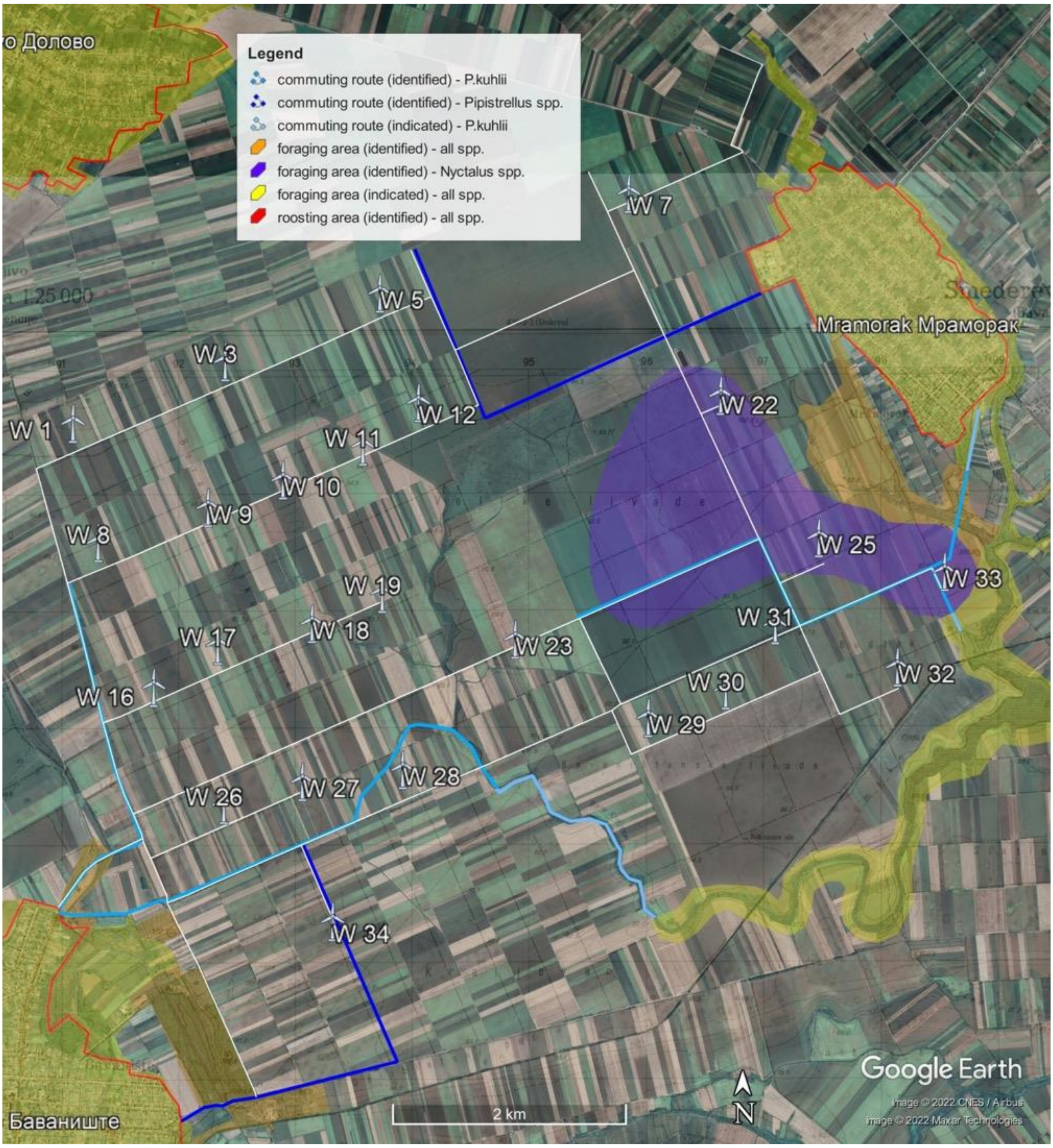

Figure 7-25 Bat Habitat Use (Ecological Functions) of the Čibuk 2 WPP Site and Immediate Surroundings

Source: GoogleEarth 2022, NES, with modification by B. Karapandža, original

Legend and notes: Locations of Čibuk 2 WTGs (W) and tracks (white lines) are also shown.

7.3.6.3 Nature Conservation Evaluation

All bat species, being Strictly Protected in Serbia and listed under the relevant international conventions, have been identified as of conservation concern.

The assessment of the nature conservation value of the occurring bat populations and their habitats within the WPP site boundary and immediate surroundings was undertaken for all species and is presented in Table 7-8.

Populations of two species were assessed as of **significant nature conservation value at a regional level**. These are resident and migratory populations of Leisler's Bat (Nyctalus leisleri), and total population of Nathusius' Pipistrelle Bat (Pipistrellus nathusii). Other species were either of **negligible value at any scale or only of value at a local level.**

Habitats of the occurring populations within the WPP site boundary were assessed as of nature conservation value at the **local** level at the most (i.e. only for the present individuals), and **not significant**.

The nature conservation evaluation undertaken here is directly comparable with the evaluation undertaken following the Čibuk 1 pre-operational surveys (Karapandža & Paunović 2019) as the same terminology and criteria were used in both. However, the two sites are clearly spatially and ecologically distinct and their bat communities different (as elaborated in sections 7.3.6.1 and 7.3.6.2). As a consequence, the evaluation of the Čibuk 1 surveys is not immediately relevant to this Čibuk 2 ESIA, except for comparison of the two sites. Similar to the strictly faunistic aspect (as elaborated in section 7.3.6.1), the nature conservation value of the Čibuk 1 site bat fauna is significantly greater, since populations of as many as 11 species occurring at the Čibuk 1 site were assessed as being of significant conservation value.

Table 7-8 Nature Conservation Value of Populations and Habitats of Bat Species of Conservation Concern at the Čibuk 2 WPP Site and Immediate Surroundings

Population / Habitats - rating and scale of nature conservation value assessed on the basis of species' population size and ecological status (Table 7-7) within the site, and encompassing population size and conservation status (Appendix C); populations and habitats valued at the regional level or higher are considered to be of significant conservation value (**blue**);
scale (level) of conservation value: local (municipal), regional (South Banat), national (Serbia), European, global;
() - at the most;
bold and ***bold italic*** refer to particular habitat types/elements and/or populations marked accordingly in the Justification column;

Justification- summarised, complete data and references are provided in tables and text above and Appendix C.

Species name	Population	Habitats	Justification
Rhinolophus ferrumequinum Greater Horseshoe Bat	minor local	negligible	Single individuals of resident population (= up to 0.2% of regional), roosting probably just beyond site boundary, incidentally occur and possible forage (and commute) within the site.
Miniopterus schreibersii Schreiber's Bent-winged Bat	major local	moderate local	Only single migrating individuals (< 1% of regional population), regularly forage across the site.
Pipistrellus pygmaeus Soprano Pipistrelle Bat	moderate local	**minor local** / negligible	Single individuals of migratory population (= up to 0.5% of regional), roosting probably just beyond site boundary, regularly forage and commute within the site. The most important foraging areas and commuting routes within the site are **certain tracks**, and rarely farmland, whilst by far more and more important habitats are located beyond the site boundary.
Pipistrellus pipistrellus Common Pipistrelle Bat	negligible	negligible	Single individuals of resident population (= up to 0.1% of regional), roosting probably just beyond site boundary, occur incidentally and possible forage (and commute) within the site.
Pipistrellus kuhlii Kuhl's Pipistrelle Bat	moderate local	**moderate local** / minor local	A small share of local resident population (= up to 0.5% of regional), roosting just beyond site boundary, regularly forage and commute across the site. The most important foraging areas and commuting routes within the site are **certain tracks**, and even farmland across the site is of some value, whilst by far more and more important habitats are located beyond the site boundary.
Pipistrellus nathusii Nathusius' Pipistrelle Bat	**minor regional**	**moderate local** / minor local	A small share of local resident and larger migratory population (= up to 0.5% and 0.7% of regional population, i.e. 1.2% total), roosting just beyond site boundary, regularly forage and commute across the site. The most important foraging areas and commuting routes within the site are **certain tracks**, and even farmland across the site is of some value, whilst by far more and more important habitats are located beyond the site boundary.
Hypsugo savii Savi's Pipistrelle Bat	minor local	**(minor local)** / negligible	Single individuals of resident population (= up to 0.3% of regional), roosting just beyond site boundary, occasionally forage (and commute) within the site boundaries. The most important foraging areas and commuting routes within the site are **certain**

Species name	Population	Habitats	Justification
			tracks, and rarely farmland across the site, whilst by far more and more important habitats are located beyond the site.
Myotis emarginatus Geoffroy's Bat	minor local	negligible	Single individuals of resident population (= up to 0.2% of regional), roosting probably just beyond site boundary, incidentally occur and possible forage (and commute) within the site.
Myotis mystacinus Whiskered Bat	negligible	negligible	Single individuals of resident population (= up to 0.5% of regional), roosting probably just beyond site boundary, rarely forage (and commute) only at the east site margin
Myotis myotis Greater Mouse-eared Bat *Myotis blythii* Lesser Mouse-eared Bat	moderate local	negligible	Single individuals of resident population(s) (= up to 0.6% of regional, NT), roosting probably just beyond site boundary, rarely forage and commute only along certain tracks.
Plecotus auritus Brown Long-eared Bat *Plecotus austriacus* Grey Long-eared Bat	negligible	negligible	Single individuals of resident population(s) (< 1% of regional, *P. auritus* VU), roosting probably just beyond site boundary, incidentally occur and possible forage and/or commute only on east and south site margin.
Eptesicus serotinus Serotine Bat	minor local	negligible	Single individuals of resident population (= up to 0.2% of regional), roosting just beyond site boundary, occasionally forage (and commute) only on east site margin.
Vespertilio murinus Parti-coloured Bat	moderate local	minor local	Single individuals of migratory population (= up to 0.7% of regional population), regularly forage across the site.
Nyctalus leisleri Leisler's Bat	minor regional	**moderate local** / minor local	A small share of local resident and larger migratory population (= up to 0.2% and 0.3% of regional, i.e. 0.5% total, NT), roosting just beyond site boundary, occasionally/regularly forage and commute across the site. The most important foraging areas and commuting routes are located in east part of the site, and even farmland across the site is of some value, whilst by far more and more important habitats are located beyond the site boundary.
Nyctalus noctula Noctule Bat	major local	**moderate local** / minor local	A small share of local resident and larger migratory population (= up to 0.2% and 0.7% of regional, i.e. 0.9% total, roosting just beyond site boundary, regularly forage and commute across the site. The most important foraging areas and commuting routes are located in east part of the site, and even farmland across the site is of some value, whilst by far more and more important habitats are located beyond the site boundary.

7.4 Noise and Vibration

7.4.1 Noise Sensitive Receptors

Potential noise sensitive receptors have been identified from aerial images and by the project team during the site inspection. These are selected to be the closest houses in the nearby settlements. The noise sensitive receptors are listed in Table 7-9 (below) together with their coordinate locations and the distance to the nearest turbine for the Čibuk 2 scheme. Some locations were chosen close to the existing Čibuk WPP farm so that the cumulative effect can be studied. It is not certain that all locations are occupied residential dwellings and some may be summer houses occupied only during part of the year. However, for the purposes of this assessment they are considered to be dwellings.

Table 7-9 Noise Sensitive Receptors

Location	Name	Receptor Co-ordinates (UTM)		Distance to Nearest Turbine (metres) and turbine No.
		Easting	Northing	
1A	Mramorak East	497689	4970557	2268 (W7)

1B	Mramorak East	498516	4969523	2380 (W33)
1C	Mramorak West	496690	4970673	1294 (W7)
1D	Mramorak West	497086	4969394	1132 (W22)
1E	Mramorak South	498108	4968407	1230 (W33)
3A	Dolovo	491716	4973138	3908 (W5)
3B	Dolovo	491438	4971199	2269 (W3)
3C	Dolovo	490686	4970629	2085 (W3)
7	North-east of Čibuk 1	496361	4977152	6821 (W7)
8	North-east of Čibuk 1	497899	4975157	5365 (W7)
8A	North-east of Čibuk 1	499565	4972609	4693 (W7)
8B	North-east of Čibuk 1	499284	4972923	4612 (W7)
9	On road north-east of Dolovo	492834	4974763	5079 (W7)
10A	Dolovo South	488590	4969427	2315 (W1)
10B	Dolovo South	488134	4969169	2651 (W1)
11A	Bavaniste	490824	4964906	1175 (W26)
11B	Bavaniste	490502	4964415	1655 (W26)
11C	Bavaniste	491644	4963759	1324 (W34)
11D	Bavaniste	492382	4962423	1837 (W34)
11E	Bavaniste	491545	4962726	1990 (W24)
12	Summer House	495812	4964368	1586 (W29)
13A	Deliblato	502481	4965817	4575 (W33)
13B	Deliblato	501512	4964526	4221 (W32)
14	House in Woods	501666	4969788	4410 (W33)

7.4.2 Baseline Noise Survey

A noise survey was carried out from May and June 2022 to determine baseline noise levels in the area. Noise monitoring was carried out for two weeks at five locations which are close to the proposed turbines in the three nearby settlements. The survey report in Appendix D.3 provides the details. Wind speeds during the survey were measured at the on-site metrological mast and the noise and wind speed results have been correlated to determine the variation in background noise with wind speed. These have been plotted as scatter plots in Appendix D.4. The results are summarised below in Table 7-10 in terms of the variation in background noise with wind speed determined from the trendlines in the scatter plots.

Table 7-10 Baseline Survey Results

Location	Period	Noise Levels (dB L_{A90}) at wind speeds (m/s) at 10m height							
		3	4	5	6	7	8	9	10
Bavanište Maksim Gorkog Street	Day	32.4	32.9	33.6	34.7	36.7	39.9	44.5	51.0
	Night	28.1	28.8	29.8	31.2	33.0	35.2	37.7	40.5
Bavanište Monastery	Day	32.4	33.7	35.4	37.5	40.0	42.8	45.9	49.2
	Night	32.7	33.4	34.2	35.2	36.5	37.9	39.7	41.9
Dolovo	Day	34.2	35.2	36.4	37.6	38.8	40.2	41.6	43.1
	Night	34.4	34.3	34.6	35.2	36.3	37.9	40.0	42.5

Mramorak North	Day	36.1	36.7	37.4	38.3	39.9	42.3	46.0	51.1
	Night	37.7	38.1	38.1	38.1	38.5	40.0	42.8	47.6
Mramorak South	Day	34.4	35.1	35.7	36.3	36.9	37.4	37.9	38.3
	Night	30.6	31.4	32.0	32.5	32.9	33.1	33.1	33.0

The results are fairly similar and demonstrate relatively low noise levels particularly at night when noise from roads and farming activity will be reduced. The lowest noise levels were recorded at night at the residential locations in Bavanište and Mramorak South. There is an increase in background noise with wind speed at all locations.

The monitoring position to the north of Mramorak is effected by the existing Čibuk WPP and at night at low wind speeds, the results appear to show higher noise levels. This is possibly an effect of the existing WPP since this source would not be expected to be lower at night and increased wind shear at night can result in higher noise levels for the same wind speed at 10 m height. The results from Mramorak North will not be used as a baseline level to set noise limits as it is already effected by turbine noise. Instead the results from the southern location in Mramorak will be used in the assessment for all locations in this village.

A survey was carried out by others over three days in December 2011 for the existing Čibuk WPP. However the results were not directly correlated with the wind speed and have not been used for this assessment.

7.5 Ecosystem Services

The Čibuk 2 project area is dominated by intensively managed arable farmland and agricultural production of crops (corn, sunflower, wheat, sugar beet, rapeseed, soybean). Bavanište village has a long tradition of the production of herbal medicines, culinary and aromatic herbs. Around 300 households produce chamomile, mint, marshmallow, oregano, and parsley on c. 1,000 hectares of land. Livestock grazing is limited and is not present within the site.

Production of crops and herbal medicines are a source of income to local farmers and represent the key provisioning ecosystem service in the area.

Fishing on the nearby Kraljevac Reservoir is recreational and subject to permitting. Deliblato Sands is a popular recreation area and hunting ground for deer and wild boar.

The natural and man-made drainage canals at the site provide a regulating ecosystem service in water flow regulation. However, the Developer does not have direct management control or influence over the drainage canals which are managed by a local public utility company. This regulating ecosystem service is therefore excluded from the assessment.

The extensive agricultural setting is not attractive for recreation or ecotourism development. Other provisioning services (e.g. freshwater, wood, fuel) are not present. The ecological quality of semi-natural and anthropogenic habitats is not favourable for wild plant species, and it supports only a limited community of wild animal species, mostly those adapted or tolerant to intensive agriculture land use.

There is no systematic irrigation in the area. The local (shallow) aquifer has a naturally high content of iron and manganese and is contaminated with organic pollutants from the untreated domestic water effluent and intensive farming activities. Bavanište completed a drinking water facility in 2017 while Dolovo has been supplied with safe drinking water from Pančevo since 2016. Mramorak and Deliblato still lack adequate drinking water treatment facilities.

Crop cultivation is considered to be priority ecosystem service in the assessment.

7.6 Landscape and Visual Amenity

7.6.1 Landscape Character

The Čibuk 2 development site lies at the southern edge of the Banat Loess Plateau, part of a vast, fertile lowland (the Great Hungarian Plain) extending between Serbia, Croatia, Hungary and Romania. The Plain landscape is predominantly flat with occasional gently undulating areas, dissected by canals and roads and intensively farmed.

This is a large-scale and open landscape, the result of a low-lying topography (Figure 7-26). Moderately populated with nucleated towns and villages and almost unpopulated countryside, it is simple and linear. The sense of tranquillity is decreased by movement and noise from roads. Extensive views are possible across open fields and are only sporadically fragmented by built development or vegetation.

Figure 7-26 Lowland Landscape of the Study Area

The concepts of Landscape Character Types (LCT) and Landscape Character Areas (LCA) have not yet been formally implemented by Serbian planning authorities. For the purpose of this assessment, a distinctive landscape area which makes the landscape in the Study Area distinct, recognisable and different to other landscape areas in Vojvodina Province, has been defined as the Banat Loess Plateau LCA.

7.6.2 Landform

The Banat Loess Plateau is a flat to gently rolling lowland extending between floodplains of the Danube and Tamiš rivers. It is a large aeolian (wind-blown) relief formed by the accumulation of loess – a silt deposited on floodplains, entrained by the wind.

The most prominent landform feature of the Banat Loess Plateau is the Deliblato Sands – a continental sand dune formed along the prevailing southeast wind corridor (see Figure 7-5). Being a relict landform, the Deliblato Sands is identified as a geological heritage site by the Institute for Nature Conservation of Vojvodina Province.

Apart from the Deliblato Sands where elevations reach up to 190m a.s.l, the majority of the Banat Loess Plateau area is almost entirely flat or gently rolling from 80 to 120m a.s.l. The development site is similar - almost flat, gently undulating towards south-west

A typical landform of the Banat loess plateau is shown on Figure 7-27.

Figure 7-27 Landform of the Banat Loess Plateau LCA

7.6.3 Land Cover and Pattern

Open subsurface loess sections can be only sporadically seen in South Banat as the region is predominantly agricultural in nature, covered in arable crop and limited deciduous woodland areas. The area is intensively farmed utilizing the fertile loess soil.

To obtain general information on the land cover within the Study Area, the EU CORINE Land Cover 2018 geodatabase has been used. The CORINE indicates that non-irrigated arable land is predominant in the area, with only occasional presence of natural and semi-natural vegetation (Figure 7-28). Watercourses are limited within a radius of 10km and urban fabric is fragmented and discontinuous.

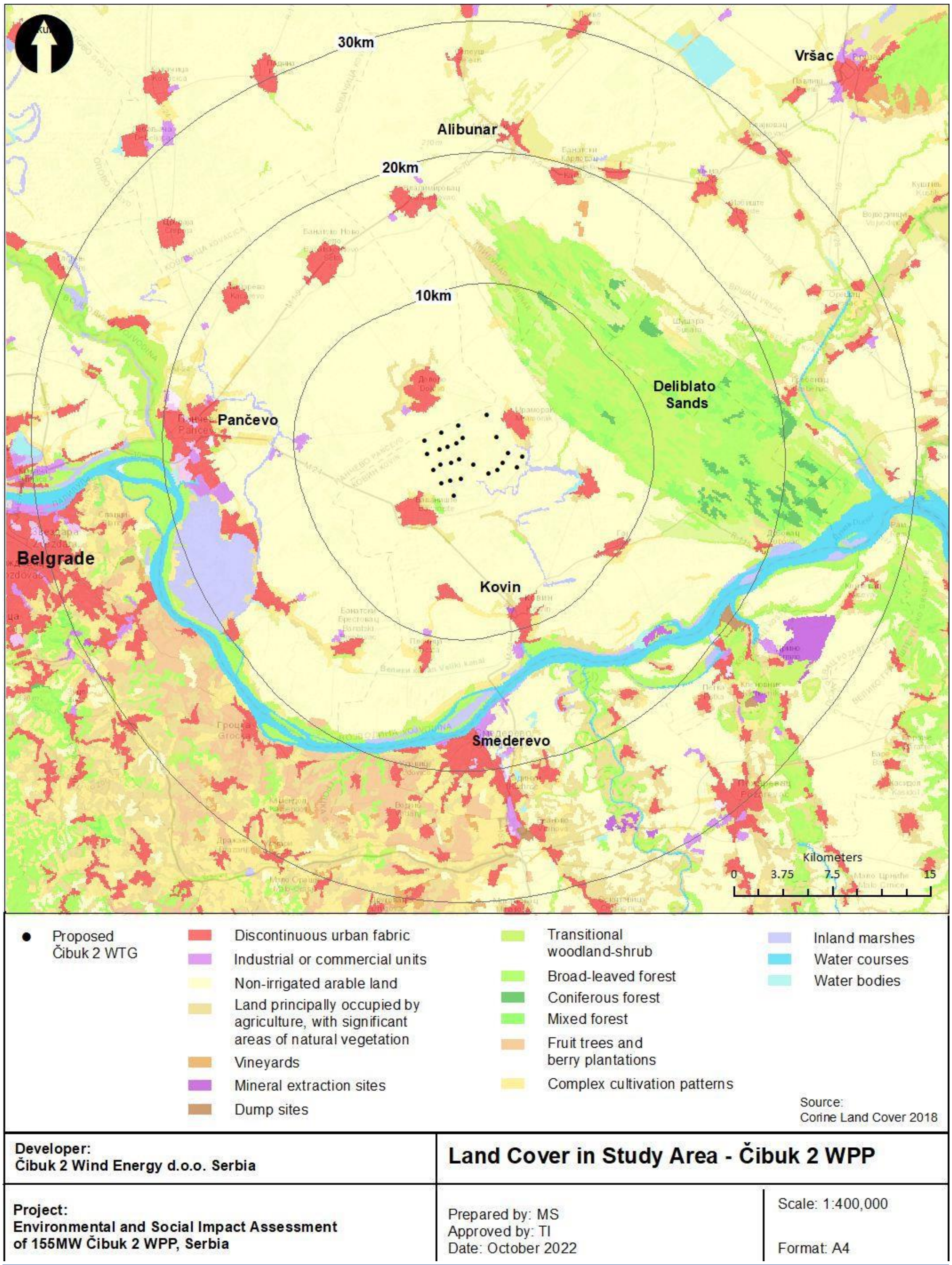

Figure 7-28 Land Cover in the Study Area

The development site and the surrounding area are covered in open fields under a variety of arable crops (primarily wheat, maize and sunflower). The land is farmed in traditional strips of varying width. Hedgerows are not common in South Banat and field boundaries are not managed. Trees and scrub are sparse and individual. A typical view of cultivated land which can be seen in the area is shown on Figure 7-29.

Figure 7-29 Cultivated Land in the Banat Loess Plateau LCA

In summer when the crops are well grown, the land strips are hardly visually distinguished from each other giving the landscape a rather continuous pattern. In winter and spring, the area has a more distinctive striped pattern. However, given the flatness and openness of the landscape the striped pattern cannot be easily discerned from the ground level.

7.6.4 Settlement

The South Banat settlement is rural and moderately dense, clustered with small nucleated towns and villages. Villages have a planned structure - a regular grid of streets with equally distanced houses. Centre of each village has community buildings and a limited number of shops.

Church spires are prominent local landmarks. Due to the multiethnicity of the area, most villages have several religious buildings. The vernacular architecture is predominant in the villages. Pannonian-style houses are characterised by their longitudinal shape and the narrow side of the house facing the street. Majority of houses are made of block with tiled roofs and one or two storeys. A typical South Banat village is shown on Figure 7-30 (Bavanište village).

Figure 7-30 Typical South Banat Settlement

Building architecture still reflects the multiethnicity with Slovak houses traditionally painted or tiled in light blue, Hungarian in green, and Romanian houses painted in white with the plinth in yellow.

Open views from within villages are largely screened by trees and other vegetation. Most houses have inward-facing gardens or courtyards, usually behind grass verges containing mature trees and providing localised screening. Long-distance views to the windfarm site are mostly available only on the edges of villages.

Industrial activity in the area is limited with most prominent industrial facilities being the small biogas plants and clay block production plant, north-east and south-west of the WPP site. Due to the open and vast landscape, the facilities do not dominate the views and the local landscape does not have an industrial character. Since 2018 the operating Čibuk 1 WPP has been present in the local landscape in the immediate vicinity of the Čibuk 2 site (Figure 7-31).

Figure 7-31 Dolovo Village and the Čibuk 1 WPP in the Background

7.6.5 Roads and Other Infrastructure

The road pattern is simple. The state roads No. 10 and No. 14 traverse the area connecting regional destinations and Serbia and Romania. The roads have moderate traffic volumes frequented by HGVs and cars (Figure 7-32). Municipal roads connect villages (Dolovo, Mramorak, Deliblato, Gaj) and have limited traffic with mostly cars and light goods vehicles.

Figure 7-32 Road No. 10 between Pančevo and Vladimirovac

Roads are flat and straight. Long-distance views from roads to the open farmland are limited. Road verges are occasional, mostly formed by scrub or small groups of trees, screening most views and providing only successive views of the windfarm site. Majority of views are middle-distance along the road corridor itself.

A view from the municipal road Deliblato – Mramorak towards Mramorak village is shown on Figure 7-33. The westernmost wind turbines of the Čibuk 1 visually overlap with a church spire in Mramorak.

Figure 7-33 The Westernmost Turbines of the Čibuk 1 WPP and Mramorak Village

Fields are crossed by narrow rough tracks and provide mostly unobstructed long-distance views.

Over the past five years, the Study Area has accommodated a few windfarms that changed the landscape character from one without windfarms to a landscape with occasional windfarms. The cumulative baseline information is provided in Chapter 9.4.6 Cumulative Landscape and Visual Impacts.

The operational Čibuk 1 wind turbines occasionally appear depending on viewpoint and are in a visual balance with the surrounding landform. Other South Banat wind turbines can be occasionally visible in the distant skyline but not at scale or extent that would make them a key characteristic of the landscape.

The view of the Čibuk 1 WPP as seen from the municipal road Dolovo – Mramorak is shown on Figure 7-34.

Figure 7-34 Čibuk 1 WPP seen from the Dolovo – Mramorak Road

Overhead power lines and telephone poles criss-cross the landscape, in no obvious pattern, and their pylons provide the main vertical element in most views.

7.6.6 Designated Landscapes

Landscape designation system has not been established in Serbia. No area in Serbia is designated based on its scenic value.

7.6.7 Landscape Sensitivity to Large Scale Wind Power Plants

The landscape in the Study Area is large scale, extensive and open, dominated by simple land cover. The landscape offers simple long-distance views across a predictive pattern of agricultural fields with a very few focal points. The sky is dominant in the view. The human influence is notable, there is no sense of remoteness, naturalness or wilderness in the landscape. In perceptual terms, the landscape is intensively managed.

The existing Čibuk 1 wind turbines are seen in the distance and despite their height they relate to the scale of the landscape both horizontally and vertically and do not dominate the scene. The landscape character has remained tranquil and visually simple. Once introduced, the Čibuk 1 WTGs reduced the landscape susceptibility to change given that wind turbines are not an uncharacteristic feature anymore.

Given its scale and simplicity, the landscape is considered to have a high capacity to accommodate windfarms and its susceptibility to change is considered to be low. While the landscape is well-managed and tidy, its features are widespread and common, and the landscape value is considered to be low. The overall landscape sensitivity to development of large-scale WPPs is therefore considered to be **low**.

7.6.8 Visual Baseline

This section identifies the extent of theoretical visibility of the proposed WPP and identifies visual receptors that would be assessed. The section also presents the viewpoints that would be used to assess effects on receptors, including reasons for their selection.

7.6.8.1 Theoretical Visibility

The ZTV maps represent a theoretical worst-case scenario where landscape is a bare ground without screening structures or vegetation, and weather conditions are most favourable. The ZTVs cannot convey the nature or magnitude of visual effects and whether effects are significant or not. However, they are very useful in confirming areas where visibility is not possible due to the intervening topography (within the tolerances of the DEM used).

As any other computer model, ZTVs have to be used with caution because they can show a place having full theoretical visibility of the turbines that in reality will have no view or the view will be marginal and the visual effect negligible.

Potential landscape and visual effects of the proposed Čibuk 2 WPP have not been assessed independently but in conjunction and in combination with the existing Čibuk 1 WPP.

To assess the incremental visual effect of the addition of the Čibuk 2 WPP, comparative ZTVs have been produced on figures A1 and A2 in Appendix A. The comparative ZTVs identify the areas where turbine hubs and blades of the Čibuk 2 WPP would be theoretically visible while the hubs and blades of the Čibuk 1 are not visible.

To assess the overall cumulative visual effect of both the Čibuk 2 and Čibuk 1 WPPs, combined ZTVs have been produced on figures A3 and A4 in Appendix A. The combined ZTVs indicate the number of turbine hubs and blades of both the Čibuk 2 and Čibuk 1 WPPs that would be theoretically visible from any given point within the Study Area.

7.6.8.2 Analysis of ZTVs

The analysis of ZTVs provided in this section has informed the selection of key visual receptors and representative viewpoints for the assessment.

The proposed Čibuk 2 WPP and the existing Čibuk 1 would be theoretically visible from about 90% of the area within 10km, with fragmented visibility within the Deliblato Sands due to the landform. There would be additional visibility of the Čibuk 2 WPP within small narrow valleys north-west and east of Bavanište where there is no view of the Čibuk 1 WPP.

Between 10 and 20km of the development site, there would be theoretical visibility from about 80% of the entire area, with obstructed views within the Deliblato Sands and additional visibility of the Čibuk 2 in the topographically lower areas between Gaj and Dubovac villages where the blades of Čibuk 1 turbines are not visible. There would be no major difference between the pattern of hub height visibility and the blade tip visibility.

Between 20 and 30km of the site, there would be theoretical visibility from over 60% of the area, mostly in the north-west and south-east. The additional visibility of the Čibuk 2 turbines is predicted in the south-east around Kostolac. The combined visibility of the Čibuk 2 and Čibuk 1 WPPs would be rather fragmented north-west of the Deliblato Sands and south-east of the Danube River, in Belgrade.

In practice, natural and man-made features will restrict or limit the theoretical visibility. Groups of trees and road-side hedgerows and houses within villages would be expected to block many views.

7.6.8.3 Key Visual Receptors

The key visual receptors in the wider area include:

- Residents and local visitors (including settlements, scattered houses, isolated houses);
- Road users;
- People engaged in recreational activities (fishing, walking, cycling);
- People working in open areas (farmers, etc.).

The settlement, agricultural works, and transport are key features in the Study Area where visual receptors might be affected by the Čibuk 2 development. No relevant railways, local walking paths or cycling routes are present.

Visitor attractions are related to sport and recreational activity on the Kraljevac Reservoir (4km to the south-east) and in the Deliblato Sands Special Nature Reserve (the area extending between 5 and 20km to the east). However, the ZTVs indicated either fragmented or completely obstructed theoretical visibility from the Deliblato Sands Special Nature Reserve due to the landform. Given the present vegetation in the Deliblato Sands, it is likely that the visibility in reality would be restricted further, therefore the Deliblato Sands is not considered further in the assessment.

In order to focus the assessment on potential significant effects, settlements within 20km of the proposed WPP have been reviewed. Beyond 20km, the main potential for views from settlements is considered to be largely theoretical and in reality, is restricted by vegetation or buildings.

7.6.8.3.1 Local Residents and Visitors in Settlements

Settlement in the Study Area is predominantly nucleated and concentrated in villages. Scattered or isolated properties are rare and mostly used as summer houses.

Within the 10km Study Area all settlements are predicted to have the theoretical visibility of the Čibuk 2 and Čibuk 1 WPPs. The settlements are Dolovo, Mramorak, Bavanište, Deliblato, Skorenovac, Gaj, Kovin.

Within 10-20km of the site, settlements of Banatski Brestovac, Pločica, Banatsko Novo Selo, Vladimirovac, Banatski Karlovac, Kačarevo, Pančevo, Smederevo are predicted to have the theoretical visibility of both windfarms' hubs and blades.

7.6.8.3.2 Road Users

The analysis of the ZTVs has determined that the proposed WPP has the potential to cause visual impacts on both main regional roads - No. 10 and No. 14 as well as on local roads between settlements. The roads No. 10 and No. 14 are busy regional roads frequented by HGVs and cars. Local roads have low traffic mostly by cars and light goods vehicles.

Within the 10km Study Area, the state roads No. 14 and No. 134 traverse south-west and south of the site and two municipal roads surround the site: (1) Dolovo - Mramorak and (2) Mramorak - Deliblato.

Within 10-20km of the site, the regional road No. 10 passes approximately 15km to the north-west and the regional road No. 14 continues southbound towards Smederevo.

7.6.8.3.3 People involved in Recreational Activity

Besides the Deliblato Sands which has been excluded from the assessment due to rather fragmented theoretical visibility of the proposed wind turbines, outdoor recreation activities are also present in the area of the Kraljevac Reservoir, approx. 4km south-east of the WPP site. Fishing and walking are popular among visitors.

7.6.8.3.4 People who work outside

People who work in the open countryside are mostly local farmers. They are assumed to be present throughout the Study Area.

7.6.8.4 Selection of Representative Viewpoints

The viewpoints were selected to be representative of the key visual receptors within the Study Area and to include different directions, distances and elevations from the site.

Representative viewpoints within villages are rare because of the nucleated character of settlement with inward-facing properties. Streets in villages are mostly lined with mature trees obstructing the long-distance views. The WPP site is more likely to be visible from houses on the edge of villages, on the side towards the development and these areas were given priority during the viewpoint selection.

Each selected viewpoint is illustrated with a photograph and wireline of the existing view, and a photomontage and wireline showing the proposed Čibuk 2 WPP.

Table 7-11 Selected Representative Viewpoints

No. Ref.	Viewpoint	Receptor Type	Distance from Nearest Čibuk 2 WTG (m)	Direction from Nearest Čibuk 2 WTG	Elevation (m a.s.l.)
1	Mramorak – southern edge of the village; Representative of views from the edge of the village, including combined views of other windfarms in the area.	Local residents; Road users; Workers in the field.	1,580	E	101
2	Municipal road Dolovo – Mramorak; Representative of views for road users and people working in the fields, including combined views of other windfarms in the area.	Road users; Workers in the field.	1,650	N	114
3	Dolovo – roadside south of the village; Representative of views from the edge of the village including combined views of other windfarms in the area.	Local residents; Road users; Workers in the field.	2,300	NW	104
4	Bavanište - western edge of the village; Representative of views from the edge of village.	Local residents; Road users; Workers in the field.	3,750	SW	84
5	Kraljevac Reservoir – higher ground area above the reservoir; Representative of visitors to the reservoir (fishermen, trekkers, etc), including combined views of other windfarms in the area.	People involved in recreation.	4,450	SE	93
6	Deliblato – southern edge of the village; Representative of views for residents, road users and workers in the field, including combined views of other windfarms in the area.	Local residents; Road users; Workers in the field.	5,300	SE	85
7	Road No. 14 – north-west of Kovin; Representative of views for workers in the fields and travellers on the road No. 14 including combined views of other windfarms in the area.	Road users; Workers in the field.	6,900	S	75
8	Gaj - roadside south-west of the village; Representative of views for workers in the fields and travellers on the road No. 18 including combined views of other windfarms in the area.	Local residents; Road users; Workers in the field.	8,900	SE	79
9	Road No. 14 – east of Pančevo;	Road users;	11,500	W	76

No. Ref.	Viewpoint	Receptor Type	Distance from Nearest Čibuk 2 WTG (m)	Direction from Nearest Čibuk 2 WTG	Elevation (m a.s.l.)
	Representative of views for road users, including combined views of other windfarms in the area.				
10	Road No. 134 – south of the Deliblato Sands; Representative of views for workers in the fields and travellers on the road No. 134 including combined views of other windfarms in the area.	Road users; Workers in the field.	13,500	W	81
11	Road No. 10 – south-west of Banatsko Novo Selo. Representative of views for travellers on the road No. 10 including combined views of other WPPs in the area.	Road users;	14,800	NW	97

7.7 Traffic and Transport

This section describes the regional road transport infrastructure that would be used once the wind turbine components are delivered by river barges and unloaded and the roads that would be used in the transport of aggregate and other construction material for the project.

7.7.1 Existing Road Network

The existing road network is moderately dense, comprising regional roads (class Ib state roads) which connect Serbia and Romania and class II state roads that travel through small towns and villages. The boundary of Čibuk 2 in the context of the local road network is shown on Figure 7-35.

The routes which would be used for access to the site during the construction phase are:

- For abnormal loads transport the route from Pančevo via either Banatsko Novo Selo and Vladimirovac or Bavanište;
- For conventional construction traffic majority of vehicles would arrive eastbound from Pančevo via Bavanište.

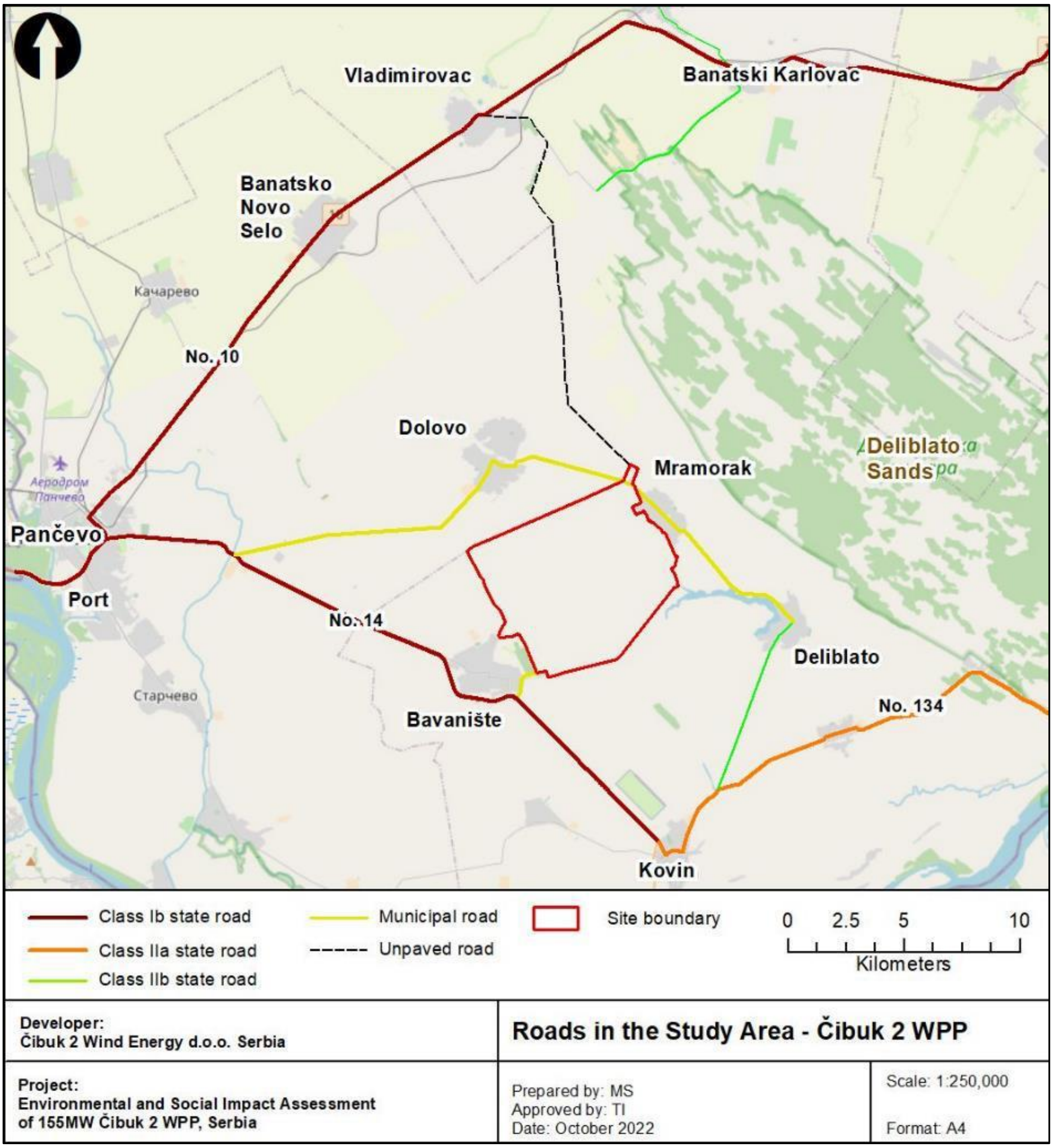

Figure 7-35 Road Network in the Study Area

7.7.2 Abnormal Loads Transport Route

At the time of writing (October 2022) the Developer is considering five options for the route for transport of the large turbine components to the site. It is likely that the WTG components will be off-loaded from barges docking at the port of Pančevo on the Danube River. The longest option (c. 45km) travels via Banatsko Novo Selo and Vladimirovac. Other shorter options (20-25km long) include the state road from Pančevo to Bavanište, municipal roads and dirt tracks (Figure 7-36).

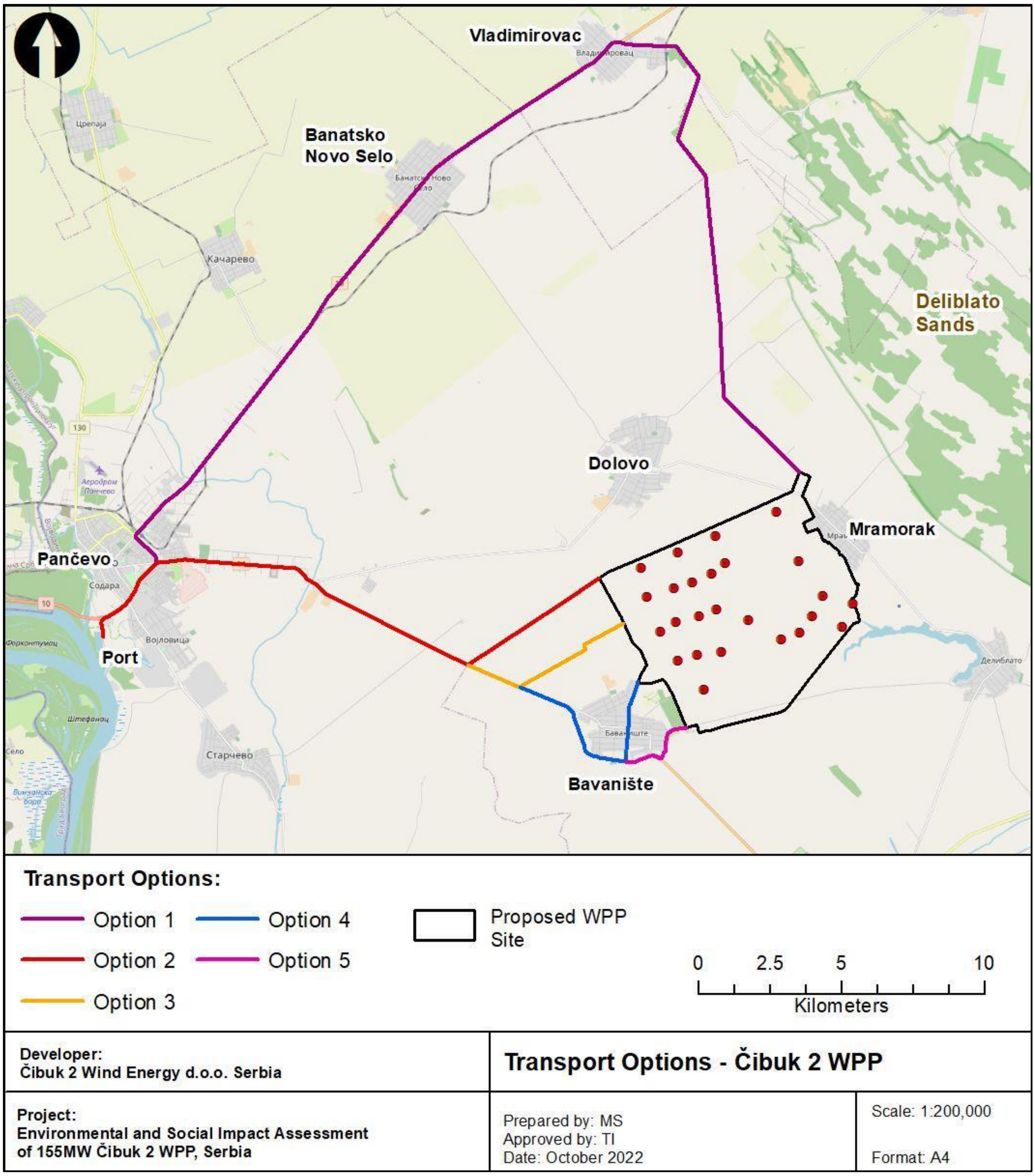

Figure 7-36 Considered Routes for Transport of the Large Turbine Components

The Option No. 1 has been used in 2018 for the transport of wind turbine components for the Čibuk 1 WPP. The route was subject to improvements, curve reconstructions, and removal of vegetation and utilities to accommodate the transport of 60m-long blades. However, the Čibuk 2 blades would be up to 80m long and the Developer is yet to assess the suitability of the route.

The transportation route will be confirmed once the turbine supplier and the overall dimensions of the WTGs have been confirmed.

7.7.3 Other Construction Transport

Construction materials will be sourced from off-site locations as the quality of rock on-site and in Vojvodina Province is not suitable for stone aggregate required for the access roads and crane hardstandings. The stone will most likely be sourced from quarries in Central Serbia, areas of Lajkovac and Valjevo, about 130km south-west of the site. It will be delivered to the site via the motorway A2 and motorway A1. Both roads have rather high traffic flows (over 15,000 vehicles per day) and the Project-related traffic is not likely to effect them.

At the time of writing, it had not been decided if an existing, commercial concrete batching plant will be used for the Project or if a plant will be constructed on or near the construction site. For the purposes of the ESIA it has been assumed that an existing, off-site plant will be used. The ESMMP includes actions for each option.

Effects associated with the WPP development would be most pronounced once the construction vehicles reach Pančevo and continue eastbound towards Bavanište and to the site. This route only partially overlaps with the one proposed for the delivery of large turbine components (c. 6.2km out of the total 25km).

7.7.3.1 Existing Traffic Flows

Traffic flows along the route proposed for the transport of turbines components vary from high to low. The most frequented roads are the section through the urban area of Pančevo where the number of vehicles reaches up to 26,000 vehicles per day and drops to 10,635 in the city outskirts. Upon exiting Pančevo, the number of vehicles drops to 4,800 per day and decreases further as the road travels northbound.

A summary of 24h average annual daily traffic (AADT) recorded in 2021 is provided in Table 7-12. The provided data for Heavy Goods Vehicles (HGV) refer to goods vehicles over 3.5 tonnes.

Table 7-12 Average Annual Daily Traffic in 2021 on Roads in the Study Area

Road	Section	Length (km)	Total AADT (2021)	HGV (> 3.5t)	% HGV
10	Pančevo (Vojvodina border) – Pančevo (Kovin)	4.9	**25,577**	1,062	4.2%
10	Pančevo (Kovin) – Pančevo (Kovačica)	1.3	**6,604**	157	2.4%
10	Pančevo (Kovačica) – Alibunar (Plandište)	31.8	**5,452**	131	2.4%
/	Vladimirovac – Banatski Karlovac (municipal road)	3.2	not counted – municipal road		
14	Pančevo (Kovin) – Kovin (Bela Crkva)	28.9	**7,999**	387	4.8%
/	Municipal road along the edge of Bavanište	1.5	not counted – municipal road		

Road sections which would be used for both abnormal loads transport and other construction material transport.

Road sections which would be used only for abnormal loads transport.

Road sections which would be used for other construction material transport and potentially for abnormal loads transport.

The route which would be primarily used for other construction material transport between Pančevo and Bavanište is c. 25km long. The route follows the state road No. 14 which has a moderate traffic volume of almost 8,000 vehicles per day. The road section is shown on Figure 7-37.

Figure 7-37 Section of the Road No. 14 Pančevo - Bavanište

The total traffic volume along the route has been steadily increasing over the past 7 years, especially following the Bavanište bypass completion in 2018 (2020 was an anomaly due to Covid-19), see Figure 7-38.

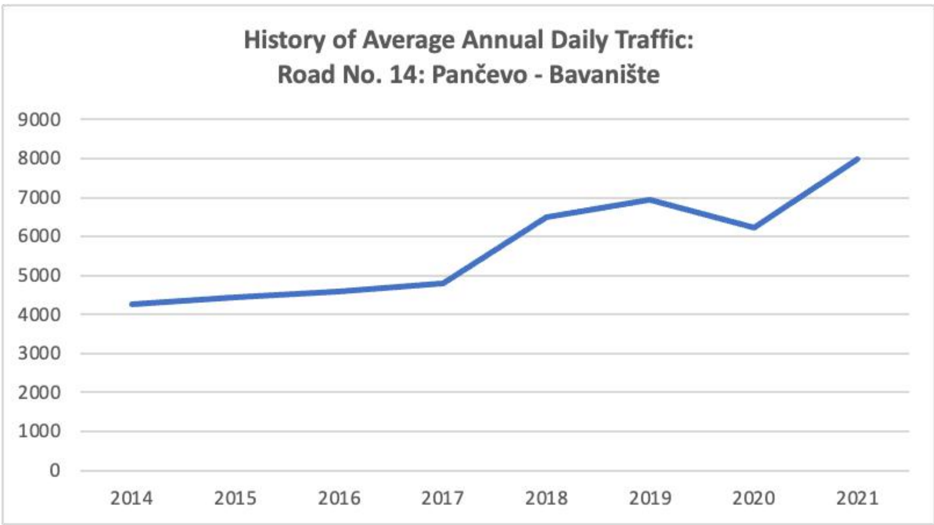

Figure 7-38 History of AADT (2014-2021) on Route: Pančevo - Bavanište

Historic traffic patterns provided by Google Traffic suggest slight congestion on the abnormal loads transport route on weekdays in Pančevo between 12:30pm and 3:30pm. The congestion has not been recorded along the route for other construction material transport (Pančevo – Bavanište).

7.7.3.2 Existing Traffic Safety

The route between Pančevo and Bavanište would be a primarily used route for the Project during the construction phase. While the transport of abnormal loads is strictly regulated in Serbia, and must be undertaken with assistance of police, other heavy goods movements for the Project would have more interaction with the local community. As the major route for heavy goods movements would be from Pančevo via Bavanište to the site, this route has been assessed in detail.

The accident statistics provides an insight to the volume of traffic along the route and a driver behaviour. Road fatality rate in Serbia is higher than in the EU. The 5-year average rate of road deaths in Serbia is 76 per 1 million inhabitants compared to 44 per 1 million in the EU. [20]

Over the past 5 years (2017-2021) a total of 332 traffic accidents were recorded in the Kovin Municipality of which 242 were with injury or fatality (73%). In the city of Pančevo a total of 1,653 traffic accidents were recorded of which 1,035 were with injury or fatality (62%). [20]

The spatial distribution of accidents is shown in Figure 7-39. There are no obvious clusters or blackspots.

Based upon the accident rate, vulnerable road user groups identified by the national road safety agency in the Kovin Municipality are pedestrians older than 65, passenger car drivers, and cyclists. In the City of Pančevo the vulnerable groups are motorcyclists, cyclists and drivers younger than 30. In the context of this ESIA pedestrians, cyclists, motorcyclists and tractor drivers are considered to be vulnerable road users.

It is of note that a significant improvement related to traffic safety along the major transport route for other construction material was made in 2018 when the Bavanište bypass road was built. The HGV traffic which travelled through the central part of Bavanište has been prohibited since 2018. As a result, the route does not intersect any residential area upon leaving Pančevo.

[20] Agency for Traffic Safety of Serbia – Annual Reports on Traffic Safety for Municipalities (2021)

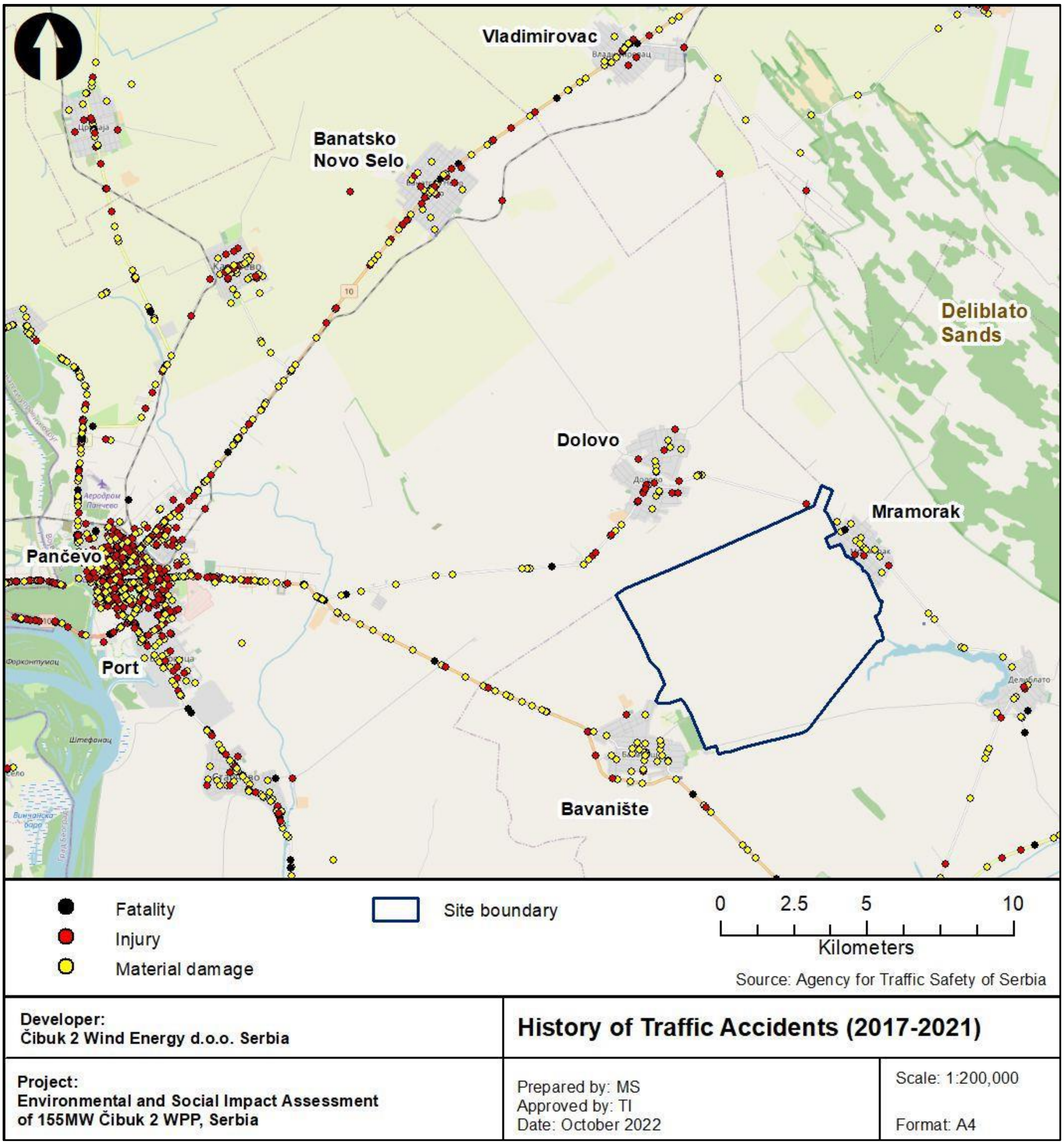

Figure 7-39 History of Traffic Accidents (2017-2021)

7.7.4 Site Access

The site will be accessed from the municipal road Dolovo - Mramorak in the north-east and the state road No. 14 and a municipal road near Bavanište in the south. A number of minor dirt roads cross the site, allowing access to the fields for farming.

7.7.5 Farm Tracks

Agricultural vehicles represent the majority of traffic within the site.

Agricultural land ownership is complex within the region and the majority of the farmland is owned by local families. Strip-farming dominates and this means that the region is crossed by numerous tracks that provide access to the land plots. The majority of these farm tracks are unsurfaced and are often very muddy following rain. During the winter months these tracks are impassable to normal road vehicles.

The farm tracks are open to public use but they are not adopted by the local authorities and are not maintained. During the construction of the WPP a number of the farm tracks crossing the site will be surfaced with crushed stone to provide access for the construction equipment. These surfaced tracks will be maintained for the operational life of the Čibuk 2 WPP.

7.7.6 Sensitivity of Roads Users and Locations

The sensitivity of roads, their users and communities along the routes within the Study Area has been assessed and summarised in Table 7-13.

Table 7-13 Sensitivity of Road Receptors, Users and Communities

Route	Road Section	Sensitivity	Justification
Preferred abnormal loads transport route	Road No. 10 around the city of Pančevo Sections: Pančevo (Vojvodina border) – Pančevo (Kovin), Pančevo (Kovin) – Pančevo (Kovačica)	Low	Class Ib state dual carriageway road with high traffic volume, constructed to accommodate general and HGV traffic moving between primary destinations. High traffic flows, minor traffic management measures in place. Slightly congested on weekdays between 12.30pm and 3.30pm.
	Road No. 10 Pančevo (Kovačica) – Alibunar (Plandište)	Low	Class Ib single carriageway road with medium to high traffic volume constructed to accommodate general and HGV traffic moving between primary destinations. Travels through villages of Banatsko Novo Selo and Vladimirovac which have limited public services. Traffic management measures in place in settlements (crossings, speed limit of 40km/h) and outside of settlements (prohibited overtaking).
	Municipal road: Vladimirovac – Banatski Karlovac	Negligible	3km-long section of the paved municipal road which travels outside of settlements with no traffic management measures in place.
Major route for other construction traffic	Road No. 14 Pančevo (Kovin) – Kovin (Bela Crkva)	Low	Class Ib single carriageway road with moderate traffic volume constructed to accommodate general and HGV traffic moving between primary destinations. Travels outside of settlements, bypassing the village of Bavanište before reaching the WPP site. Minimal traffic management measures in place in settlements (prohibited overtaking).
	Municipal road along the edge of Bavanište	Negligible	1.5km-long section of the paved municipal road which travels outside of the settlement with no traffic management measures in place.

8 Socio-Economic and Cultural Setting – Human Geography

8.1 Introduction

The Čibuk WPP site is located north-east of Belgrade on the territory of Kovin municipality, which administratively belongs to the South Banat District (part of the Serbian northern autonomous province of Vojvodina).

The site comprises agricultural fields, surrounded by three villages – Mramorak and Bavanište, belonging to Kovin municipality and Dolovo, territorially belonging to the City of Pančevo.

The South Banat District, including Pančevo and Kovin, is one of the most ethnically and religiously heterogeneous regions in Europe. Due to the presence of several national minorities among the local population, in Kovin municipality, alongside the Serbian language, Hungarian and Romanian are also official languages. In Pančevo, Bulgarian and Macedonian are also official languages in some settlements, depending on the makeup of the local population.

Kovin municipality is the home of the nature reserve "Deliblato sands", which is the largest sandy terrain on the continent, and is otherwise known as the "European Sahara".

Figure 8-1 A Walk Through the Deliblato Sands at the End of the Day[21]

In the last ten years, the municipal budget of Kovin has increased by over 50% and is an estimated 11.4 million EUR in 2022, as shown in Table 8-1. During the same period, the budget of Pančevo City has increased by close to 65% and amounts to 56.2 million EUR in 2022. The municipal budget is dependent on income transferred from higher levels of government, while the municipality itself is able to collect only some local taxes and fees, which are not key sources of funding for smaller municipalities like Kovin.

[21] Project implemented by the citizens' association Serbia, My Home, co-financed by WEBG as the owner of the Čibuk 1 WPP (photo taken from https://zdravopancevo.rs/deliblatskom-pescarom-u-smiraj-dana/)

In Pančevo, in 2020, 37.1% of municipal assembly deputies were women, which is slightly more than in Kovin (35.6%) and similar to the national average (37.2%).

Table 8-1 Municipality Budgets

Municipality	Year	Budget in RSD	Budget in EUR
Kovin	2022	1,339 million	11.4 million
Pančevo	2022	6,614 million	56.2 million

8.2 Population and Demographics

Čibuk 2 will be constructed on agricultural fields, between the small villages, Mramorak, Bavanište and Dolovo.

The estimated total population of all three villages is slightly below 15,000 (see Table 8-2). Compared to the previous population census, held 10 years before, the population has reduced dramatically in Mramorak (by 14.5%), and to a lesser degree in Bavanište (4.5%) and Dolovo (6.1%). As the data that is presented below is from 2011 census, it is highly likely that these numbers have reduced even more in the last ten years, as is the trend in the general area and Serbia as a whole.

Table 8-2 Population of the Villages around the Project Site

Municipality	Village	Population
Kovin	Mramorak	2,689
	Bavanište	5,832
Pančevo	Dolovo	6,146
	Total	**14,667**

At the municipal level, the situation is similar, characterised by a significant decrease of the population. The estimated population in 2021 and how it compares to data from the population census in 2011 is provided in Table 8-3.

Table 8-3 Population of Municipalities

Municipality	Population (2011)	Population (2021 est.)	Less %
Kovin	33,770	30,459	- 9.8%
Pančevo	123,445	118,163	- 4.3%

The ratio of men to women is almost equal (51% men to 49% women) in both municipalities. The average age in both Kovin and Pančevo, for men and women, has increased over the past decade, as can be seen in Table 8-4. The working age population (15 to 64) in Kovin municipality is estimated at 20,000 (approx. 66% of the population). Applying the same estimates for local villages surrounding the Project site, about 8,000 people residents belong in this category.

Table 8-4 Population Average Age

Geographic unit	Average age (2021)		Average age (2011)	
	Men	Women	Men	Women
Republic of Serbia	42	44.9	40.2	42.9
Kovin	42	44.9	38.4	41.6
Pančevo	41.6	44.6	39.5	42.1

The aging index in Kovin for 2021 is high at 146.9. This means that there are 1.5 older people (60 and older) for every younger person (0-19 years of age) in the population. This is also higher than the national aging index in 2021, of 144.5. In Pančevo the aging index in 2021 is lower at 139.9. However, what is even more alarming is that this index has significantly increased since 2011, when it was 109.2 in Kovin and 115.2 in Pančevo, signifying that the population is aging rapidly in this part of Serbia.

The rate of emigration has not changed significantly in Kovin over the last ten years and about 500 people leave the municipality each year. The number of people emigrating from Pančevo has increased over the last ten years, from 1,390 in 2011 to 1,614 in 2021. Interestingly, the number of people immigrating to these areas has been increasing in the last ten years. In Kovin, in 2011 a total of 308 people immigrated to the municipality and in 2021, that number increased to 421, while in Pančevo the number of immigrants in 2011 was 1,202 and in 2021, it was 1,739. The increase is believed to be tied to economic development in the area, attracting employees from other parts of Serbia.

The average age of women in both Kovin and Pančevo is higher than the men. Women also have a longer life expectancy at birth. In Kovin, life expectancy in 2021 is close to 72 years (68 for men and 76 years for women), which is slightly lower than the national level average. In Pančevo, life expectancy is better at close to 74 years (71 for men and 76 for women). The most significant causes of death in 2019, in both municipalities, were cardiovascular diseases and tumours (accounting for more than 60% of deaths in both municipalities, with a ratio of 2 for cardiovascular to 1 for tumours).

According to the latest population census in 2011, in both municipalities, the majority of the population are of Serbian ethnicity (75% in Kovin and 79% in Pančevo). The most significant minorities in Kovin are Hungarians (9%), Roma (4%) and Romanians (3%). In Pančevo, the most significant minority are Macedonians (4%), followed by Hungarians and Romanians (3% each).

Reports from the Republic Institute for Social Protection for 2021, show that the share of social welfare beneficiaries in the total population in Kovin municipality is more than three times higher than the share at the level of the republic, and four times higher if looking at only female beneficiaries. The fact that more than one third of the population in this municipality are beneficiaries of social welfare is alarming. In Pančevo, the share of beneficiaries is lower than national averages.

Table 8-5 Share of Social Welfare Beneficiaries in the Total Population

Geographic unit	Share of social welfare beneficiaries in the total population (2021)		
	Total	Men	Women
Republic of Serbia	10%	9.7%	10.3%
Kovin	36.1%	29.9%	42.5%
Pančevo	7.3%	6.6%	8%

The data presented in Table 8-5 includes individuals who are beneficiaries of not only financial aid, but also all types of welfare services, such as foster care, institutional care, home care services and similar, and is a relevant indicator of general vulnerability of the population. The number of people receiving financial social assistance through Centres for Social Welfare and the share of beneficiaries of this assistance in the total population, provided in Table 8-6 below, indicate the levels of poverty in the municipality. Close to 7% of residents of Kovin are receiving financial aid, which is more than double the share at the national level. In

Pančevo, the share of beneficiaries of financial assistance is again lower than at the national level (almost half).

Table 8-6 Number and share of Beneficiaries of Financial Assistance in the Total Population

Geographic unit	Number of beneficiaries of financial social assistance in the total population (2021)	Share of beneficiaries of financial social assistance in the total population (2021)
Republic of Serbia	204,286	2.8%
Kovin	2,010	6.6%
Pančevo	1,764	1.5%

8.3 Economic Activity and Employment

Kovin has been categorised as an underdeveloped municipality because the level of development is between 60% and 80% of the Republic level average (Ref: Decree on Establishing a Uniform List of Regional Development and Local Self Government Units for 2014 of the Republic of Serbia[22]). The criteria used for categorising municipalities under this government decree, include GDP per capita, as well as general trends in population numbers, unemployment, and education. The City of Pančevo is categorised as belonging to the first group of municipalities whose level of development is above the national average.

In the municipality Kovin the main two areas of economic activity are:

- Agriculture is the dominant economic activity in South Banat, including Mramorak, Bavanište and Dolovo. Wheat and corn, as well as sugar beet, sunflower, beans and potatoes are the most significant agricultural products.
- Industry is a secondary activity and includes food processing, metal processing, pharmaceuticals, wood manufacturing and production of construction materials, and

In the municipality Pančevo the main two areas of economic activity are:

- Industry is the dominant economic activity and the Municipality belongs to a group of highly developed in Serbia. The most widely known company is HIP–Petrohemija, a Serbian petrochemical company.
- Agriculture is the second most developed economic activity, which is supported by a developed food processing industry.

In discussions with local community representatives, it was highlighted that agriculture is important for the local population, however, most of the land is in fact farmed by only several large-scale agricultural producers, who either own the land or rent it from local families and the state.

Average households rely on salaries for income, and many people migrate daily for work in Pančevo or Belgrade. At the same time, smaller fruit orchards and vegetable gardens are often kept as a source of healthy products for household consumption.

The number of active companies in Kovin municipality has been steady at about 340 in the past few years. Although there has been a rise of more than 36% in the last decade, the number of registered sole traders has increased in the last few years (1,091 in 2022). In Pančevo, the number of active companies and entrepreneurs has been rising in the last few years and in 2022, there are 1,943 companies and 5,879 sole traders. The increase in the number of registered active companies in the last decade has been slower than in Kovin at 9%.

Employment data from 2020 in both municipalities is provided in Table 8-7, below[23]. It should be noted that this employment data refers to employment according to the place of work; i.e. it shows how many people are working on the territory of the municipality. Employment has been steadily increasing in both municipalities in the last six, seven years and this trend was unaffected even during the Covid-19 pandemic.

[22] Official Journal of the RS 104/2014
[23] Registered employment by municipality, 2020 (Statistical Office of the RS)

Table 8-7 Employment Data

Municipality	Registered employment	of which in Legal entitles	of which self employed	of which agricultural holdings
Kovin	6,457	70%	22%	8%
Pančevo	32,017	77%	21%	1%

In 2020, the percentage of employed people who were either registered entrepreneurs (self-employed) or working for them, was equal in both municipalities (22%). In Pančevo, 77% of employed persons were working in legal entities, while only 2% were registered as individual agricultural producers. In Kovin, there were more registered individual agricultural producers (8%) and less employed in legal entities (70%).

Unsurprisingly, most people working in both municipalities are employed in the industrial processing sector and trade, both wholesale and retail. The construction sector also ranks quite high in both municipalities. Significant numbers of people are also employed in public administration, education, health and social welfare. In Kovin, more people are employed in agriculture, forestry and fishing, while in Pančevo, the number of people employed in the transport and storage sector is higher.

When analysing the employment data according to the place of residence, meaning the employment status of residents of the two municipalities, in 2020, a total of 8,570 persons (of whom 39% women), residents of Kovin municipality, were registered as employed. In Pančevo, a total of 38,873 persons (of whom 45% women) were registered as employed. The number of employed persons residing in both municipalities has also been steadily growing.

The average annual net salaries and wages in both municipalities, as in the rest of the country, have been growing since 2010, as presented in Table 8-8. While Pančevo is close to the national average, Kovin is still far behind, with the national average higher by over 20%.

Table 8-8 Average Annual Net Salaries and Wages and Trends

Geographic unit	Average annual net salaries and wages (September 2022)		Average annual net salaries and wages (2010)	
	RSD	EUR[24]	RSD	EUR[25]
Republic of Serbia	74,981	639	34,142	331
Kovin	62,400	532	29,478	286
Pančevo	73,121	623	37,592	365

The number of active companies registered with the Serbian Business Registers Agency in Pančevo has increased in the last decade by 13% and in Kovin by a whole 35%, consistent with the national level which has also been steadily growing (28% higher than in 2010).

Table 8-9 Active Companies and Trends

Municipality	Active companies in 2021	Active companies in 2011
Republic of Serbia	133,379	104,394
Kovin	339	252
Pančevo	1904	1680

[24] Average exchange rate for September 2022 (1 EUR = 117.3246 RSD)
[25] Average exchange rate for 2010 (1 EUR = 103.0431 RSD)

The main unemployment parameters from October 2022 for Kovin and Pančevo are provided in Table 8-10. Women make up approx. 52% of registered unemployed persons in Kovin, which is lower than the national average (56%). In Pančevo, the percentage of registered unemployed women is much higher at 63%.

In Kovin, close to 49% of the registered unemployed people have some qualifications or have completed secondary school, followed by 46% of those who have no qualifications. In Pančevo, the greatest percentage of registered unemployed persons also have some qualifications or have completed secondary school (56%) however the percentage of those with no qualifications is lower than in Kovin, at 31%. Consequently, there is a higher percentage of people with higher education and qualifications (13%) registered as unemployed, which is expected having in mind the more urban character of Pančevo city.

Registered unemployment has been decreasing in both municipalities in recent years, as with the rest of the country.

Table 8-10 Unemployment Data

Municipality	Registered unemployment	of which women	Newly registered	of which women	Employed from the register	of which women
Kovin	1,557	815	106	57	76	46
Pančevo	5,198	3,289	415	245	320	198

8.4 Education

According to the last available data from the 2011 population census, in Kovin municipality, approximately 20% of people have no education or incomplete primary education (63% of whom are women), 27% have basic primary education, 45% have secondary education and 8% have college or university level education (52% of whom are women). A total of 3.08% of the population is illiterate (4,43% of women, 1,73% of men).

In Pančevo, approximately 10% of people have no education or incomplete primary education (72% of whom are women), 20% have basic primary education, 55% have secondary education and 15% have college or university level education (55% of whom are women). A total of 1.6% of the population is illiterate (2,44% of women, 0,71% of men)

In line with the municipal ethnic structure, in three elementary schools in Kovin, children can attend primary school in Hungarian language, but none are located in the villages surrounding the Project site. There are also two secondary schools on the territory of the municipality, but many children travel to neighbouring towns and cities, including Pančevo and Belgrade, to continue their education after completing primary school.

8.5 Healthcare and Emergency Services

From the Project site, the closest general hospital is in Pančevo city centre (approx. 20 km).

The municipality has a primary health care centre in the town of Kovin which also provides emergency medical services. In addition, in all the villages there are small health clinics, including pharmacies in several of them. There is one private outpatient facility operating in the municipality and numerous private pharmacies.

The number of doctors per 1,000 inhabitants in Kovin is 2.6 and in Pančevo 2.8 which is almost the same as the national average of 2.9.

8.6 Infrastructure

Kovin municipality has approximately 107 km of roads, of which 34% are paved, national roads, while 66% are paved, municipal roads (maintained by the municipality). The length of roads increased with the construction of the Čibuk 1 project in 2017 and 2018. Pančevo has 141 km of roads, of which 52% are paved national roads and 48% are municipal, also paved roads. All communities adjacent to the project area have paved access roads. State Road No. 14 Pančevo-Kovin passes through Bavanište village and is the closest state road to the Project site.

The transportation route for WTGs will be confirmed once the turbine supplier and the overall dimensions of the WTGs have been confirmed. The most likely scenario is for the WTG components to arrive by barges to the port of Pančevo, from where they would be transported either along State Road No. 14 or State Road No.

10 via Vladimirovac village in the north. After exiting the city of Pančevo, this route passes through two additional settlements, Banatsko Novo Selo and Vladimirovac. Construction related transport will also affect the villages Mramorak and Bavanište, which is why stringent traffic management will be one of the key requirements for this Project.

The electricity, telecommunications and gas networks are developed in all local communities. There is no public sewage system in any of the settlements and sewage water is mainly discharged to septic tanks. Solid waste disposal is organised in all local communities. All of the villages have street lighting and they have bus connections to the centres of the municipalities or other parts of the country.

In both municipalities almost all of the households are connected to the water supply network (99.6% in Pančevo and 97.1% in Kovin). In Pančevo, the number of water supply connections has increased by more than 44% in the past decade, while in Kovin, this percentage was already achieved. The quality of water in local water networks is often below acceptable standards.

About 70% of the households in Pančevo and 40% in Kovin, are connected to the public sewage network. These percentages have increased significantly in the past ten years, and in Pančevo the number of connected households has been tripled and in Kovin, doubled.

8.7 Civil Society

According to the Serbian Business Registry Agency, the number of registered and active civil society organisations in Kovin has been consistent in the last few years, at around 230 registered organisations. In Pančevo, as an urban centre, the number of active registered organisations is higher (911 in 2022). In the past few years the number of such organisations has been slowly increasing.

Civil society organisations in both municipalities are very heterogeneous and active in many different areas, including distribution of humanitarian aid, running soup kitchens, preserving traditions and culture of national minorities, animal protection, recreational hunting, fishing and beekeeping, associations of pensioners, women, youth, people with disabilities or war veterans, organisations active in the field of transport and fostering economic growth, environmental protection organisations, etc.

8.8 Land Use and Property Ownership

The total area of the municipality Kovin is 730 km^2 and over 60% of its territory is agricultural land. The total area of the Project site defined by the Zoning Plan (for Čibuk 2 and 3) as about 4,750 ha (47.5 km^2) and comprises almost entirely arable land, used for growing corn, sunflower, wheat and similar crops. There are no structures in the project area, residential or non-residential, which will need to be acquired and therefore the Project will not cause any physical displacement.

The Project requires the use of land for the construction of 25 WTGs, foundations and maintenance pads. Limited land may also be acquired for the installation of underground cables, although the majority of them will be installed under existing access tracks and roads. Some acquisition of land will also be needed for the upgrading and widening of existing access roads. The existing access tracks which are owned by the municipality will be upgraded for Project use. In some areas it may be necessary to widen the roads by using privately owned land, which is why the Project Developer plans to sign easement contracts with owners of the needed land.

All of the land acquisition has been and will continue to be carried out through voluntary agreements, without the use of (or possibility of) expropriation or any other involuntary process.

Long term easement contracts have been signed for the construction and operation of 25 WTGs as part of Čibuk 2. Each WTG requires the use of 3,500 m^2 (8.75 ha in total) and this land will be occupied during construction and will remain occupied during operation for maintenance pads. After contract signature, owners have been paid a one-off amount for using the land for any preparatory works. When construction starts, they will be paid annual easement amounts, which they can also chose to receive at once, in which case they receive 50% of the total 25 year easement amount.

Acquisition of land for the 25 WTGs has impacted a total of 30 land plots belonging to 34 owners, of whom 11 are women, located in the cadastral municipalities Mramorak and Bavanište. The individual contracts were agreed and signed between November 2020 and May 2022 and all 25 positions have been secured. The owners are still using their land normally, until construction begins, when the parts of the plots under easements will become unavailable for use. However, they will be able to continue to use the parts of land plots which are not needed for the Project.

Consistent with the practice on other similar projects, all loss of crops and any other damage occurring before or during construction or operation of the WPP, will be compensated to the owners of these assets at full replacement cost, based on reports from certified agricultural valuators. This has been the practice for Čibuk 1 and all interviewed stakeholders expressed their satisfaction with the process, Local communities are assisting affected land owners in filing grievances and requests for compensation and this will continue for Čibuk 2.

8.9 Social Investment and Local Development

Based on an agreement on business and technical cooperation between WEBG and the municipality of Kovin for Čibuk 1, each year 2% of the net profit is donated for local development, distributed as 1.5% for the municipality Kovin and 0.5% for the local community Mramorak. For 2020, the allocated amount was used for the procurement of an ultrasound machine for the health care centre in Kovin and the paving of the local road and parking in Mramorak village. The amount allocated for 2021 will be three times the amount allocated for 2020. WEBG is waiting for proposals from the municipality for Projects to be financed from this amount. As the profit from the WPP increases, the allocated amounts will also increase.

In February 2022, the same type of contract was signed between C2WE and the municipality Kovin for Čibuk 2. However, in addition to 1.5% of the net profit which will be allocated for supporting local development in the municipality, 0.5% will be used directly for the local community Bavanište.

The operators of Čibuk 1 (WEBG) have implemented an impressive Social Investment Plan ("SIP") that began during the construction phase and continues during the operational phase. This SIP provides direct support to civil society and local initiatives primarily in communities around the Project site but also to other projects across the municipality. To date, WEBG has supported over 100 projects and activities in relation to a whole variety of areas including infrastructure improvements, local development, investments into education, environmental protection, local culture and traditions, etc.. Support has been given to many different community groups, including vulnerable populations such as the elderly, persons with disabilities, young people and children. WEBG will continue this programme of support and information is available on the company website: http://www.teslawind.rs/en/corporate-social-responsibility. C2WE intend to take a similar approach during the construction and operation of Čibuk 2.

8.10 Archaeology and Cultural Heritage

There are no designated cultural heritage features within the development site or its vicinity. However, the local area has been suspected by the statutory stakeholder (Institute for Cultural Heritage in Pančevo) to contain archaeological artefacts and features from the Late Antique and Medieval periods. By law, areas which are suspected to contain valuable cultural heritage assets are considered to be preliminary designated cultural heritage areas.

During the statutory consultation on the Location Conditions, the Institute for Cultural Heritage in Pančevo provided information that the area of the proposed Čibuk 2 site was subject to a pre-construction archaeological field survey between December 2021 and January 2022. Based upon the survey results, the Institute identified three preliminary designated cultural heritage areas relevant for the Čibuk 2 WPP development:

1. Potes Bezubice, north of Bavanište, is an area which was under rescue excavation in 2014 when ceramic artefacts from the 3rd - 4th Century AD were discovered. The WTGs No. 1 and 8 are proposed in this area;
2. Potes Budžak and Livade, along the western arm of the Kraljevac Bog, is an area where Late Antique artefacts were discovered in the past (e.g. copper axe, fragments of bronze helmet). The WTG No. 33 is proposed in this area;
3. Potes Bavaništansko Polje and Velike Livade, is an area where fragments of medieval ceramic were found in the past. The WTGs No. 12 and 18 are proposed in this area.

With respect to the construction of Čibuk 2, these areas are designated as the 1st degree protection zones where a pre-construction rescue excavation is mandatory. A further four areas within the site have been identified as the 2nd degree protection zones which require permanent archaeological supervision during the excavation works on the turbines foundations and associated underground cabling. The remaining site area has been identified as a 3rd degree protection zone where general precautionary measures must be implemented. The areas are shown in Figure 8-2.

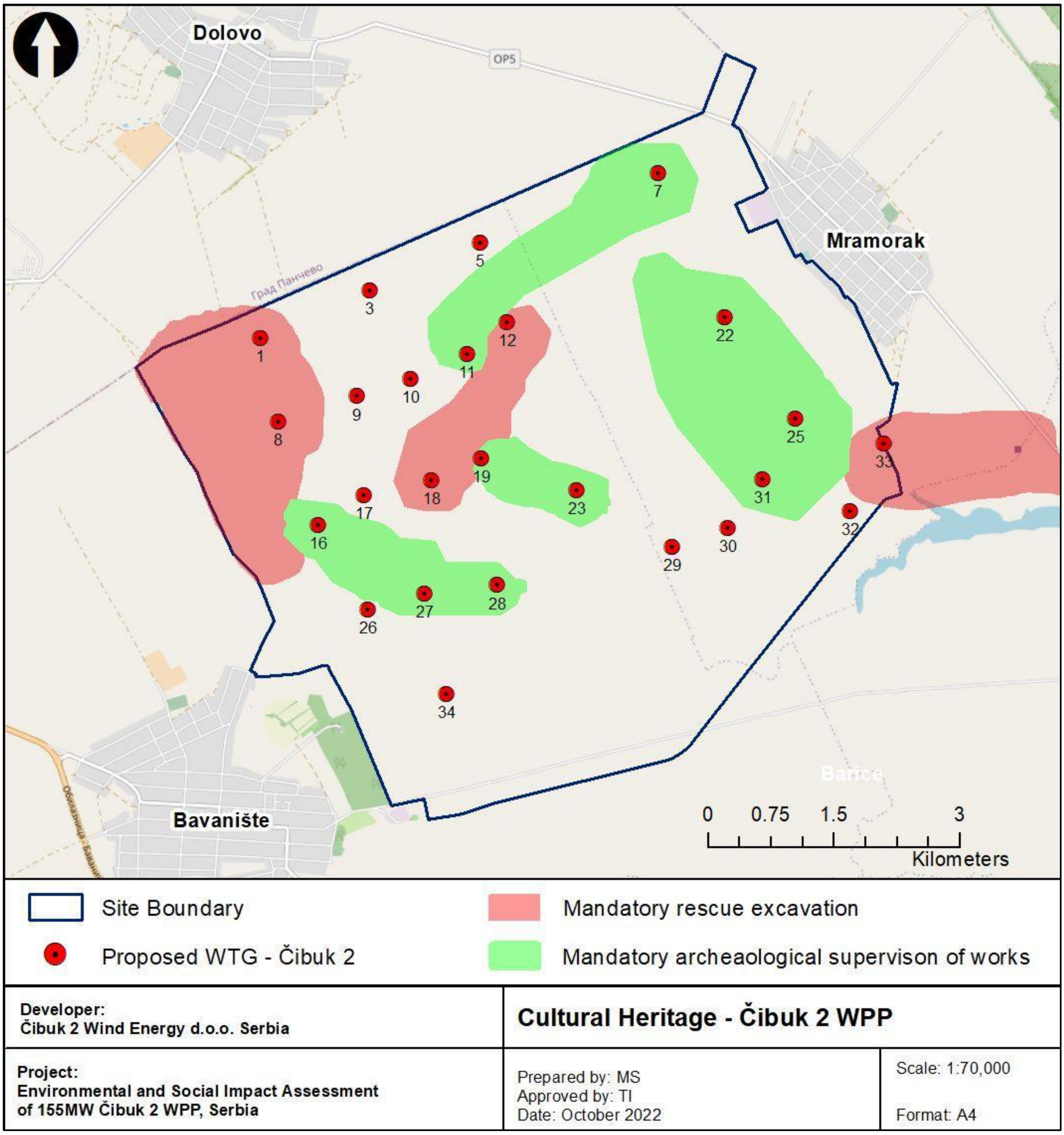

Figure 8-2 Identified Areas of Archaeological Artefacts

Given the presence of locally significant archaeological features, the site sensitivity in respect to cultural heritage is considered to be medium.

9 Project Wide Impacts

9.1 Climate Change Risk Analysis

According to the Serbian national weather service (Republic Institute for Hydrometeorology), 2018 was the warmest year on record in Serbia and 2019 was the warmest year since modern measurements began in 1951. The summer of 2022 was the third warmest summer (after 2017 and 2012) in Serbia but the warmest summer in Vojvodina Province since the measurements began.

Over the past 60 years the country experienced a significant increase of daily mean, daily maximum, and daily minimum temperature, with an average increase of 0.36°C per decade. After 1990 only four years showed negative anomalies, while eight out of ten warmest years occurred after 2000.[26]

The change in rainfall has not been linear and differs for regions and seasons. While the average rainfall increase is slight and insignificant, the rainfall patterns significantly changed. Summer months experienced a significant drop in rainfall. Extreme rainfall events have become more frequent, both the number of days with heavy rainfall and number of days without rainfall have increased.[26]

9.1.1 Observed Climate Change in South Banat

Compared to the baseline period 1961-1990, the average annual temperature in Vojvodina increased for 1.0-1.5°C over the period 1998-2017 and increased for 1.0-2.0°C over the period 2008-2017.

The average annual rainfall increased by 5% during the period 1998-2017 but decreased by 5% in the period 2008-2017 periods. However, in summer months during 2008-2017, the average annual rainfall decreased by 10% compared to the baseline period.

The observed increase in temperature is most notable when climate indices are analysed, particularly the icing days (annual count of days when maximum daily temperature is below 0°C). During the period 2008-2017 the annual number of icing days decreased for 3 days in the South Banat region (Figure 9-1).[26]

The increase of tropic days (annual count of days when maximum daily temperature is equal or above 30°C) was up to 25 days. The number of extreme heat waves (more than 6 days when air temperature is higher than 90th percentile) increased for 2 (Figure 9-1).[26]

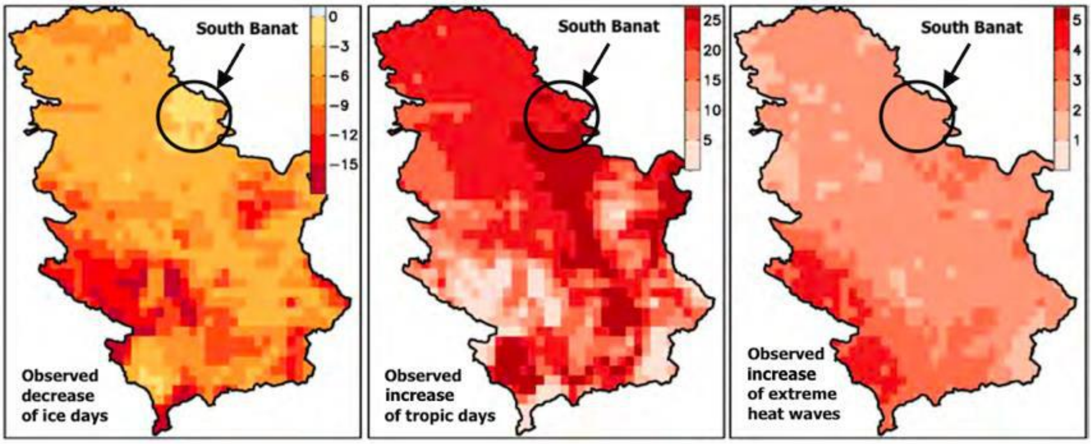

Figure 9-1 Observed Change of Climate Indices during 2008-2017 compared to 1961-1990

9.1.2 Future Climate Projections for South Banat

The project operational life is considered to be 30-35 years. It is assumed that the project will be fully operational by 2025 and that the project lifetime will continue to 2055-2060.

[26] V. Đurđević, A. Vuković, M. Vujadinović Mandić (2018) - Observed Climate Change in Serbia and Future Climate Projections based on Scenarios of Future Emissions. *GEF.*

The information on future climate projections for the Čibuk 2 area have been provided from the most recent Serbian official studies based on regional climate models, for the periods relevant to the project operational life (2016-2035, 2046-2065). The models have been developed to have high resolution and to be sensitive to local topographies and climate features and are considered to be of high confidence.[27]

The modelling methodology was in line with the IPCC Fifth Assessment Report, i.e. future changes were compared to the base period 1986-2005 and were provided for two Representative Concentration Pathway (RCP) scenarios of GHG emissions:

- RCP4.5 – stabilisation scenario, with GHG emissions peak around 2040 and decline afterwards;
- RCP8.5 – constant increase scenario.

As a general note, the models suggest that the air temperature in Serbia will continue to rise during this century, reaching values which will be 3 to 5°C higher than values during mid-20th century. This change is expected to further destabilise the climate system in Serbia in terms of the increase of extreme weather events - heat waves, severe drought episodes and high-intensity rainfall events. Extreme cold weather episodes will become more intense due to the disruption of the global climate system.

The key projections for the South Banat region are the following:

- Average annual temperature is certain to increase;
- Total annual precipitation will fluctuate. It will slightly increase by 2035, including summer. After 2046 the total precipitation will increase but will decrease in summer;
- Number and intensity of heavy rainfall events are certain to increase, especially in summer;
- Summer months (June, July, August) are the most vulnerable to climate change when highest anomalies in the temperature increase are predicted with certainty;
- Number and duration of extreme heat waves is certain to increase;
- Wind resource will remain stable, within the natural variation.

<u>Projected Change of Temperature</u>

The future temperature projections for South Banat in the coming decades suggest the increase of average annual temperature as shown in Table 9-1.

Table 9-1 Projected Mean Annual Temperature Changes in South Banat

Period	Mean Annual Temperature Change (RCP4.5 Stabilisation Scenario)	Mean Annual Temperature Change (RCP8.5 Constant Increase Scenario)
2016 – 2035	↑ Increase 1.0°C	↑ Increase 1.5 – 2.0°C
2046 - 2065	↑ Increase 1.0°C	↑ Increase 2.0 – 2.5°C

In summer months (June, July, August) the temperature increase will be more pronounced than in other seasons. In the near future (2016-2035) the summer temperature will increase for 1.5°C (RCP4.5) or 2°C (RCP8.5). By mid-century the worst-case temperature could increase for 2-2.5°C.

One of the consequences of an increase in temperature and humidity will be an increase in the frequency of lightning storms. Lightning is most common in July, June and May. The frequency of lightning appears to have slightly increased (35 days compared to 32) over the last 20 years but it is not certain whether this is just a natural variation. It cannot be ruled out that the frequency of lightning storms, and therefore potential strike on the WTGs, will increase.

[27] Ana J. Vuković, Mirjam P. Vujadinović, Sonja M. Rendulić, Vladimir S. Djurdjević, Mirjana M. Ruml, Violeta P. Babić, Dunja P. Popović - Global Warming Impact on Climate Change in Serbia for the period 1961-2100. *Thermal Science: Year 2018, Vol. 22, No. 6A, pp. 2267-2280.*

Projected Change of Precipitation

The future precipitation projections for South Banat suggest slight increase of annual precipitation until 2035 under both scenarios, slight increase for the stabilisation scenario (RCP4.5) but further increase for the constant increase scenario (RCP8.5) in the second period (2046-2065), as shown in Table 9-2.

Table 9-2 Projected Mean Annual Precipitation changes in South Banat

Period	Mean Annual Precipitation Change (RCP4.5 Stabilisation Scenario)	Mean Annual Precipitation Change (RCP8.5 Constant Increase Scenario)
2016 – 2035	↑ increase 0 - 5%	↑ increase 0 - 5%
2046 - 2065	↑ increase 0 - 5%	↑ increase 5 – 10%

However, in summer months (June, July, August) the total annual precipitation is expected to fluctuate. In the near future (2016-2035) the precipitation in summer will increase for up to 5% (both scenarios). By mid-century the precipitation is projected to decrease in summer for 10-20% (RCP4.5) and decrease for 5% (RCP8.5).

Projected Change of Icing Days and Snow Cover

Following the projected temperature increase, the number of icing days (daily Tmax < 0°C) and frost days (daily Tmin < 0°C) are predicted to further decrease across Serbia.

Mid-century projections which relate to the WPP operational life are not available, however, the decreasing trend is to be expected. By the end of this century, the number of icing days in South Banat is projected to decrease by 5 (optimistic scenario RCP4.5) or by 15 (pessimistic scenario RCP8.5).

The duration of snow cover is projected to continue to decrease.

Projected Change of Wind Resource

There is an emerging consensus in the scientific community that changes in regional wind resources will be relatively stable by mid-century. By the end of the century in Europe the mean annual energy density will increase in the north (e.g. over Denmark and the UK) and slightly decrease over the south (including the Mediterranean).[28]

Projections for Serbia are available only at the timescale 2071-2100 which is beyond the Čibuk 2 WPP project life. They suggest that the annual wind speed will slightly decrease by the end of the century compared to the 1971-2000 period.[29]

While the mean annual wind speed is expected to remain stable, occasional windstorms and gusts cannot be excluded.

9.1.3 Key Climate Change Risks Relevant for the Čibuk 2 WPP

Based upon the observed and projected climate change in South Banat the climate change risks that have been identified as relevant for the proposed WPP are air temperature increase, change in rainfall pattern, and change in wind pattern.

The overall risk level has been obtained by combining the likelihood and severity of the impact according to the methodology described in section 6.3.7 Climate Change Risk.

The climate change risk analysis for the proposed Čibuk 2 WPP is presented in Table 9-3, below.

[28] Sara C. Pryor, Rebecca J. Barthelmie, Melissa S. Bukovsky, L. Ruby Leung and Koichi Sakaguchi (2020) - Climate change impacts on wind Power generation. *Nature.*
[29] Zorica Podrascanin, Vladimir Djurdjevic (2018) - The influence of future climate change on wind energy potential in the Republic of Serbia. *Theoretical and Applied Climatology.*

Table 9-3 Climate Change Risk Analysis for the Project

Climate Related Hazard	Climate Related Risk	Likelihood	Severity	Risk	WPP Operational Risk	Adaptation Measures
Air Temperature Increase						
More intense and longer heat waves; Increase of number of tropical days and nights.	Maximum daily temperature reaching 35º C and higher.	Very likely	Minor	Medium	- Turbine overheating; - Reduction of turbine power capacity; - Increase of turbine downtime; - Failure of heat-sensitive electrical equipment; - Grid connection issues.	Mitigation by design: (1) Reduction of power capacity at 35º C; (2) Complete turbine shutdown at 40º C;
Rainfall Pattern Change						
Thunderstorms / increase of days with lightning.	Increased frequency of lightning strikes.	Moderate	Moderate	Medium	- Turbine damage/ fire; - Blade damage; - Increased O&M costs.	Mitigation by design: Lightning protection incorporated into the blades; receptors located at multiple points along the blade length.
Wind Pattern Change						
More frequent and intense windstorms and gusts.	Increased periods of wind speed above the cut-out speed	Moderate	Minor	Low	- Reduction of energy production; - Increase of turbine downtime; - Extreme loading blade fatigue; - Damage of power transmission lines;	Blade condition monitoring. Regular blade inspections.

9.2 GHG Displacement

In a wider context, beneficial impacts of the Čibuk 2 WPP project are related to contribution to decarbonisation of the Serbian energy sector and production energy without adverse air quality impacts.

Both decarbonisation and ambient air quality have been relatively neglected topics in Serbia where significant investment is needed for the clean energy transition, preceded by more decisive political actions. Despite ratifying the 2015 Paris Agreement and committing to reduce the GHG emissions 9.8% below 1990 levels by 2030, the country has done very little in tackling the climate crisis. The key climate change legislation (The Law on Climate Change) has been adopted in 2021 but the by-laws are pending.

The Serbian government plans to add 1,000MW in the wind power sector by 2025 which would make a total of 1,500MW with the existing WPPs. However, Serbian energy sector is still highly dependent on fossil fuels accounting for more than 80% of the country's GHG emissions. Compliance with the EU Directive on Large Combustion Plants has not been achieved, despite the country obliging to do by being a contracting party to the Energy Community Treaty with the EU since 2006. State-owned, lignite-fired Thermal Power Plants (TPPs) are the major source of SO_2, NOx and particulate matter (PM) emissions with abatement systems of questionable efficiency. The TPPs emissions (especially SO_2) have been exceeding the limits set in the National Air Emission Reduction Plan.[30] The TPPs are one of the contributors to the poor ambient air quality in Serbia (besides individual combustion units and the transport sector) and are among ten top most polluting coal power plants in Europe.[31]

In November 2020, Serbian government accepted the EU Green Agenda for the Western Balkans (Economic and Investment Plan) by signing Sofia Declaration[32], pledging to follow the European Union in its decarbonisation path towards a carbon neutral economy by 2050.

This section contains the calculation of GHG emission reduction (expressed in CO_2 equivalent) that would result from the Čibuk 2 WPP operation. The methodology used for calculation is based upon the internationally recognized IPCC Guidelines and the IFIs Harmonized Approach to GHG Accounting (2015).

According to the methodology, emission reduction for windfarm projects is the difference between baseline and project emissions when generating the same amount of power.

Baseline emissions are the scenario "without the windfarm project", i.e. the number of emissions that would be generated for the same amount of power by existing grid-connected power plants if the windfarm project was not developed.

Project emissions are the amount of GHG emissions generated by a project during a typical year of operation. For windfarms, the project emissions are considered to be zero or minor. The construction emissions are also excluded from calculation as they are acknowledged to be low compared to the construction of other types of power plants.

The calculation of the CO_2 emission reduction by a WPP is therefore a calculation of the baseline "no project" scenario. It is a product of the energy generated by a windfarm and the country specific grid emission factor.

The grid emission factor represents the CO_2 emission from grid-connected power plants in a specific country - those currently operating and those that are expected to be built. The grid emission factor used in this calculation is the Combined Margin for Intermittent Electricity Generation, provided in The IFI Dataset of Default Grid Factors v.3.1 (December 2021) derived from IPCC Guidelines for National GHG Inventories.[33]

The Combined Margin Grid Emission Factor for wind power projects in Serbia is 933 grams CO_2 per kilowatt hour (or 0.933 metric tonnes CO_2/MWh).

The estimated energy production of the Čibuk 2 WPP for 155MW and 25 WTGs is c. 430,000 MWh/ annum.

The calculation is as follows:

Displaced CO_2 = Energy generated by a windfarm (MWh/per annum) * Country Specific Emission Factor for Electricity Combined Margin

430,000 MWh/per annum * 0.933 tCO_2/MWh = 401,190 tCO_2/ per annum.

[30] Comply or Close - Bankwatch (2019), https://bankwatch.org/wp-content/uploads/2019/12/comply-or-close.pdf
[31] Chronic Coal Pollution: EU action on the Western Balkans will improve health and economies across Europe – HEAL, 2019 https://www.env-health.org/wp-content/uploads/2019/02/Chronic-Coal-Pollution-report.pdf
[32] https://berlinprocess.info/wp-content/uploads/2021/02/Leaders-Declaration-on-the-Green-Agenda-for-the-WB.pdf
[33] The IFI Dataset of Default Grid Factors v3.1 (December 2021)

The Čibuk 2 WPP would displace c. 401,190 metric tonnes of CO_2 during every year of its operation that would otherwise be generated by existing grid-connected power plants in Serbia.

9.3 Beneficial Impact on Air Quality

The beneficial effect to ambient air quality is calculated as the offset of SO_2, NOx and PM emissions that would otherwise be generated by Serbian lignite-fired power plants for the same amount of power as the Čibuk 2 WPP (155MW).

The average pollutant emissions from the Western Balkans TPPs are estimated to 82 t/MW of SO_2, 9.5 t/MW of NOx and 3.3 t/MW of PM.[34]

For 155MW of power the pollutant emission reduction is therefore calculated to be 12,710t of SO_2, 1,473t of NOx and 512t of PM.

9.4 Cumulative Impact Assessment

In the anticipation of new Serbian legislation that should regulate the competitive tendering procedure for renewable energy projects, a new cycle of WPP development has started in 2020. There are estimations that around 2,000MW of wind power developments (2 billion EUR investment) will be unlocked by the new regulatory framework[35]. At the moment of writing (October 2022) a number of WPP schemes in the South Banat region have been in various stages of development.

For the purpose of this assessment, the WPPs are categorised as operational, under construction, consented or proposed. Information on WPP locations, power and turbine dimensions is provided in Table 9-4 and is based on publicly available planning and permitting documents.

Table 9-4 Planned WPP Developments in South Banat

No.	Name	Status	Max. Power	Number of Turbines	Hub Height (m)	Rotor Diameter (m)	Tip Height (m)	Distance from Nearest Čibuk 2 WTG (km)
1.	Čibuk 1	Operational	157 MW	57	110	120	170	2 N
2.	Elicio Alibunar	Operational	42 MW	21	100	98	149	18 N
3.	Elicio Malibunar	Operational	8 MW	4	100	98	149	21 N
4.	Košava	Operational	69 MW	20	117	126	180	20 NE
5.	Kovačica	Operational	104.5 MW	38	110	120	170	25 NW
6.	Kostolac	Construction	73 MW	20	117	126	180	21 SE
7.	Bela Anta 1	Consented (design under redevelopment)	120 MW	35	Not available	Not available	200	7 NW
8.	WindVision Alibunar A	Consented	96.6 MW	23	120	120	180	18 NW
9.	WindVision Alibunar B	Consented	71.4 MW	17	120	120	180	20 NW
10.	Pupin (Kovačica 2)	Consented	95.5 MW	18	115	170	200	29 NW
11.	CWP Vetrozelena	Proposed (Scoping stage)	300 MW	50	165	170	250	0.8 N

[34] Chronic Coal Pollution: EU action on the Western Balkans will improve health and economies across Europe – HEAL, 2019 https://www.env-health.org/wp-content/uploads/2019/02/Chronic-Coal-Pollution-report.pdf
[35] https://balkangreenenergynews.com/bgen-round-table-what-does-the-state-need-to-do-to-unlock-eur-2-billion-in-wind-farm-investments/

No.	Name	Status	Max. Power	Number of Turbines	Hub Height (m)	Rotor Diameter (m)	Tip Height (m)	Distance from Nearest Čibuk 2 WTG (km)
12.	Bela Anta 2	Proposed	80 MW	25	Not available	Not available	200	8 NW
13.	Elicio	Proposed	60 MW	Not available	Not available	180	250	8 W
14.	WindVision NBT	Proposed	120 MW	31	Not available	Not available	250	16 NW
15.	WindVision BNS	Proposed	125 MW	28	Not available	Not available	250	15 NW
16.	Plandište	Proposed	102 MW	20	151	158	240	35 NE
17.	WindVision Banat 1	Proposed	50 MW	18	161	160	241	23 NW
18.	Crepaja	Proposed	220 MW	30	135	190	230	20 NW

A map of WPP developments in South Banat and their status is presented in Figure 9-2.

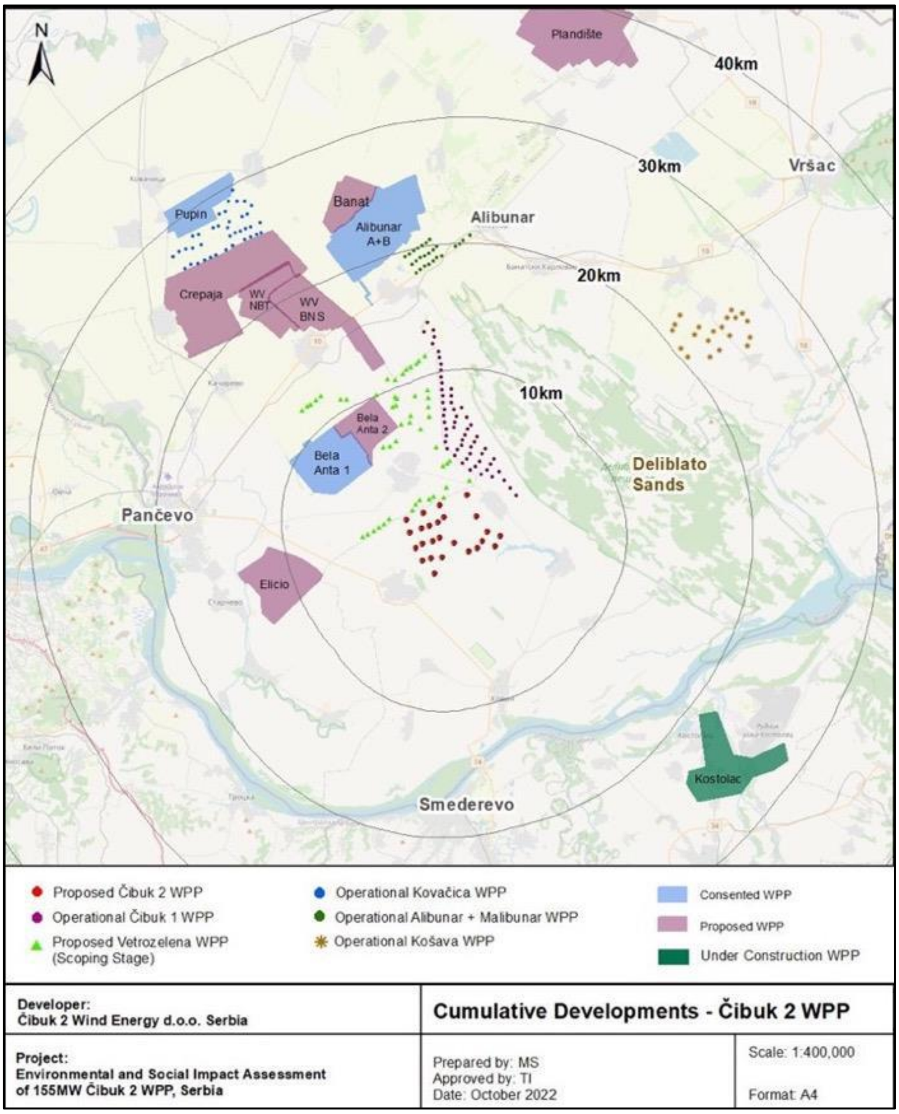

Figure 9-2 WPPs in South Banat

9.4.1 Cumulative Impact on Ecology and Nature Conservation

This section identifies, characterises and evaluates all potential cumulative impacts of the Čibuk 2 WPP project on birds and bats and their habitats, including designated sites, identifies and describes mitigation measures needed as well as provides an assessment of the significance of any residual effects.

Several large-scale WPPs are already operational in the South Banat region at the time of writing and several more are being developed. These projects will affect the same regional bird and bat populations and their habitats, including priority VECs, and thus their effects will be cumulative, and likely additive (SNH 2012). Although not significant residual effects were assessed for each individual WPP for which such information is available, considering the cumulative number and scale of relevant projects, cumulative effects could be significant. Therefore, a detailed assessment of the cumulative impacts of WPP projects in the South Banat region on bird and bat populations is considered needed.

Assessment of cumulative effects that would be based on specific information on impacts of each of the projects is not possible, due to the unavailability of detailed information for most of the relevant projects. However, approach based on extrapolation of available information to all South Banat region WPPs is considered robust and informative and is thus implemented).

Only those ecological features considered to be potentially affected by the project and of significant nature conservation value (identified as priority VECs in this ESIA) should be subject to detailed assessment of cumulative impact (IFC 2013, SNH 2012, CIEEM 2016). For ecological features not identified as priority VECs, no detailed assessment is needed (CIEEM 2016, SNH 2018a) since any potential cumulative impact could only be not significant as well.

9.4.2 Designated Sites

The ESIA has assessed the possible **direct** cumulative impacts on designated sites, including habitat loss and degradation, which is presented in this section. Possible indirect impacts, on bird and bat populations of the designated sites, are presented in following sections, where applicable. No designated site was identified as VEC in this assessment, and cumulative impacts on designated site have been considered only generally.

9.4.2.1 Potential Impacts

This ESIA has concluded that there will be **no** direct impact of the Čibuk 2WPP on **any designated site**.

Kraljevac SNR / Deliblato Sand IBA is the only designated site that could possibly be directly impacted the Čibuk 2 WPP. However, no other of the South Banat WPPs is located within or adjacent to this site, and thus **no** direct cumulative **impact** is ascertained.

All other designated sites are situated distinctly beyond the site boundary, and Čibuk 2 WPP cannot contribute to any possible direct cumulative impacts on any of these sites. Therefore, **no** direct cumulative **impact** on any other designated site is also ascertained.

9.4.2.2 Mitigation Measures and Significance of Residual Effects

Since no direct cumulative impact on any designated site is concluded, **no mitigation** is considered needed, and **no residual effects** can be expected associated with additional cumulative impacts.

9.4.3 Habitats

This ESIA has assessed the possible **direct** cumulative impacts on all habitats within the South Banat region, including destruction and degradation, which is presented in this section. Possible indirect impacts, on their bird and bat populations, are presented in following sections.

The impact of the introduction of invasive species is not considered as it must be prevented under Law.

No habitat has been identified as priority VEC in this assessment, which would require a detailed assessment of possible impacts (IFC 2013, CIEEM 2016), and cumulative impacts on habitats have been considered only generally.

9.4.3.1 Potential Impacts

9.4.3.1.1 Farmland

All of the South Banat WPPs are developed in arable farmland habitats. The adherence to legal requirements, NPCs and GIIP should ensure that any protected and potentially valued habitat type will be excluded from development even when located within WPP sites boundaries. Therefore, only farmland habitat is / will be lost permanently (for the operational life of each WPP) to the construction of WPPs infrastructure or disturbed temporarily (during construction). Habitat loss depends almost only on a number of WTGs, whilst WTG size (roughly proportional to maximum power) has no effect on scale of ground infrastructure and only negligible effect on the construction activities. Therefore, habitat loss has been quantified in relation to the number of WTGs.

About 0.2 ha per WTG is / will be lost to WTG foundations and platforms, 0.1-0.5 ha per WTG to access tracks (widening of the existing and construction of new), and up to 0.1 ha per WTG to control building / substation complexes, totalling 0.4-0.8 ha per WTG permanently lost to WPP infrastructure. Additional area of 0.1-0.2 ha per WTG is / will be temporarily disturbed during the construction. This means that the cumulative **permanent loss** of farmland habitat will be up to 442 ha, whilst up to 110 ha will be **temporarily disturbed**, which equates to **0.08%** and **0.02%** of the South Banat region area, respectively. Considering such small magnitude of the impact and insignificant nature conservation value of this habitat type, the direct cumulative impact is assessed as **negligible**, and **not significant**.

9.4.3.1.2 Woodland/scrub, grassland, marshland, wetland and canals

The adherence to legal requirements, NPCs and GIIP should ensure that all protected and potentially valued semi-natural habitats will be excluded from development, even when located within WPP sites boundaries. This includes in particular **woodland/ scrub**, **grassland**, **marshland**, and **wetland**, as well as irrigation **canals**. Therefore, **no** direct cumulative **impact** on these habitats is ascertained.

9.4.3.2 Mitigation Measures and Significance of Residual Effects

Since no or negligible direct cumulative impact on habitats is concluded, **no mitigation** is considered needed, and **no residual effects** can be expected.

9.4.4 Birds

This ESIA has assessed the possible cumulative impacts on all bird species populations occurring within the South Banat region, including the loss of habitats and mortality in nests due to construction, displacement due to construction and operation, and collision mortality due to operation.

Illegal activities, such as deliberate killing of protected bird species (including destruction of nests and eggs), are not considered, since they must be prevented under Law.

The magnitude, direction and scale of potential cumulative impacts were assessed on the basis of expected impacts of individual WPPs, species ecology and susceptibility to potential impacts, and South Banat populations' nature conservation value (IFC 2019), size and other demographics (Appendix C).

9.4.4.1 Potential Impacts

9.4.4.1.1 Loss of habitat

This ESIA assessed none or negligible cumulative loss of any habitat to the WPP infrastructure at the South Banat region level (as elaborated in section 9.4.3). Therefore, **no** (or ***negligible*** at the most), and **not significant**, impact is assessed for all species populations (including priority VECs). Species-specific elaboration is provided in Table 9-8.

9.4.4.1.2 Displacement

Displacement is where birds are excluded from the areas (of WPP and its surrounding) that were suitable for them before the development, due to either disturbance through construction and maintenance activities or avoidance of the operating WTGs. It may also include barrier effects in which birds are deterred from using normal commuting or migration routes and prevented from reaching some destination due to WPP acting as a barrier along the route (SNH 2017, 2018a).

No impact of displacement due to construction was assessed on all species from each WPP for which such information is available. Also, all populations using the habitats within the WPP sites for nesting and/or foraging are already habituated to constant human presence and intense activities in the area, including the use of agricultural machinery in particular, and not very susceptible to disturbance that will be caused by construction. Furthermore, construction works will not likely be undertaken simultaneously at different WPPs, and will even be carried out gradually at any single WPP (only one or few WTG at a time), and thus only a small part of single sites will be exposed to a disturbance at any time. Although construction may cause some localised and short-term disturbance, this cannot be considered displacement and will not have any cumulative effect. Therefore, a **no** cumulative **impact** of displacement **due to construction** is ascertained for **all** bird species **populations** (including priority VECs).

Individuals of all occurring populations, either using the sites or only flying over them, will certainly exhibit avoidance behaviour towards operating WTGs or take other evasive action to prevent a collision. However, this is considered displacement only if such behaviour results in a change of home range, territory, or flight route (possibly over time), so that bird no longer uses the area (or parts) of the operational WPPs or flight route above (SNH 2012).

The birds passing over the WPP sites only, may increase their flight height in the area of the operating WPPs (vertical avoidance), but also change their flight routes to take them around the WPPs (horizontal avoidance). Since they do not use the habitats within the WPP sites, such avoidance might only be considered a barrier effect, though only if permanent and interrupting regular flight routes. However, no significant impact of displacement due to operation (including barrier effect) on species recorded in a passage only was assessed from all of the WPPs for which such information is available. This is because only single individuals of these species occur rarely at the most, if at all, above the relevant WPP sites, which clearly indicates that none of them has regular flight routes within the scope of this Assessment. These species include priority VECs: Common Snipe (*Gallinago gallinago*), Common Sandpiper (*Actitis hypoleucos*), Short-toed Snake-eagle (*Circaetus gallicus*), Eastern Imperial Eagle (*Aquila heliaca*), Booted Eagle (*Hieraaetus pennatus*), White-tailed Eagle (*Haliaeetus albicilla*), Black Kite (*Milvus migrans*), and Long-legged Buzzard (*Buteo rufinus*), as well as a number of other species. Furthermore, the only actual negative effect (of any avoidance option) on affected populations of these species could be a rare and slight increase in single birds' energy expenditure, which cannot be considered displacement. Therefore, **no** cumulative **impact** of displacement (barrier effect) **due to operation** is assessed on **populations passing** only over the WPP sites, including priority VECs listed above. Species-specific elaboration is provided in Table 9-8.

Similarly, birds commuting over the WPP sites, might also only be affected by the barrier effect, again, only if avoidance is permanent and interrupts regular commuting routes. A few species of waterbirds, their wintering populations only, have been observed commuting above all of the WPPs for which such information is available, including priority VEC Greater White-fronted Goose (*Anser albifrons*). However, such commuting is recorded almost only during very cold winter periods when smaller surface waters in the region freeze, above most WPPs rarely or incidentally, the closer to the Deliblato Sands or DTD Canal the more often, though still occasionally at the most. Therefore, no or negligible impact of displacement due to operation (including barrier effect) on species recorded in commuting only was assessed from all of the WPPs for which such information is available. Furthermore, based on available data, the main commuting route of wintering waterbird populations within the scope of this Assessment, though used occasionally at the most, is located along the Deliblato Sands and DTD Canal, and will remain unobstructed. Also, none of the potentially affected species is considered susceptible to barrier effect from operating WPPs (Langston & Pullan 2003, Hötker *et al.* 2006, European Commission 2010, Gove *et al.* 2013). Although parts of the commuting route may shift slightly to avoid operating WPPs, it is considered highly unlikely that this commuting route will be permanently interrupted or drastically changed even as a result of cumulative effects. The only actual negative effect on commuting birds would be a rare and slight increase in energy expenditure, which cannot be considered displacement (barrier effect), and is expected to further decrease as birds habituate and the commuting route adapts. Therefore, **no** cumulative **impact** of displacement (barrier effect) **due to operation** is assessed on **populations commuting** only over the WPP sites, including priority VEC Greater White-fronted Goose wintering population.

None of the South Banat WPPs will act as a barrier along the only important migration route (i.e. flyway) within the scope of this Assessment, the Danube river valley (BirdLife International & Wetlands International 2021), since located at least 10 km away. Furthermore, no impact of displacement due to operation (including barrier effect) on migrating populations was assessed from all of the WPPs for which such information is available. However, in the areas of all of the WPPs for which such information is available, small migrating flocks of few species were observed, though rarely at the most. The rare occurrence of small migrating flocks of White Stork (*Ciconia ciconia*), the only migrating population considered priority VEC, was only recorded above the WPPs closest to DTD Canal or Deliblato Sands. This could indicate that a share of the migrating population sometimes uses alternative route along or takes slight detours to the DTD Canal and/or Deliblato Sands Deliblato Sands, from the main migration route located along the Danube river valley, though in negligible numbers and only rarely. If the birds will continue to use this minor alternative route, they would likely exhibit either vertical or horizontal avoidance towards operating WPPs, and the only actual negative effect would be a rare and slight increase in energy expenditure, which is not considered a significant displacement (barrier effect). White Stork is considered potentially susceptible to barrier effect from operating WPPs (Hötker*et al.* 2006, European Commission 2010), and thus it is considered possible that cumulative impact could lead to barrier effect. However, even if the birds would be completely and permanently displaced from this minor alternative route, only a negligible share of the migrating population using this alternative route would be affected (and even collision risk will be reduced). Therefore, **no** or **negligible**, and thus **not significant**, cumulative **impact** of displacement (barrier effect) **due to operation** is assessed on **populations migrating** only by (rarely across) the region, including priority VEC White Stork migrating population.

The populations using the habitats within the WPP sites for foraging are already habituated to intense human activities in the area. Furthermore, according to current knowledge, there is no indication that foraging of most of the species is susceptible to significant displacement at operating WPPs (Langston & Pullan 2003, Hötker*et al.* 2006, European Commission 2010, Gove *et al.* 2013), including priority VEC breeding populations of Common Quail (*Coturnix coturnix*), Western Barn Owl (*Tyto alba*), Western Marsh Harrier (*Circus aeruginosus*), Northern Goshawk (*Accipiter gentilis*), European Bee-eater (*Merops apiaster*), Common Kestrel (*Falco tinnunculus*), Eurasian Hobby (*Falco subbuteo*), Northern Raven (*Corvus corax*), Sand Martin (*Riparia riparia*), Greater Short-toed Lark (*Calandrella brachydactyla*), Crested Lark (*Galerida cristata*), Eurasian Skylark (*Alauda arvensis*), and Northern Wheatear (*Oenanthe oenanthe*). Therefore, although avoidance behaviour will cause a slight increase in energy expenditure, this cannot be considered displacement, and **no** cumulative **impact** of displacement **due to operation** is assessed on **most populations foraging**, including priority VECs listed above. Species-specific elaboration is provided in Table 9-8. However, there are a few possible exceptions, including priority VECs, the Saker Falcon (*Falco cherrug*) breeding population and Hen Harrier (*Circus cyaneus*) wintering population, whose foraging can be susceptible to displacement to some extent. Therefore, a more detailed assessment in this respect is considered needed for these species populations and is provided below.

The populations using the habitats within the WPP sites for nesting are also already habituated to intense human activities in the area. Furthermore, according to current knowledge, there is no indication that nesting of most of the species (whose nesting was confirmed within at least some of the WPPs for which such information is available) is susceptible to displacement at operating WPPs (Langston & Pullan 2003, Hötker*et al.* 2006, European Commission 2010, Gove *et al.* 2013), including priority VEC breeding populations of European Bee-eater (*Merops apiaster*), Common Kestrel (*Falco tinnunculus*), Northern Raven (*Corvus corax*), Sand Martin (*Riparia riparia*), Greater Short-toed Lark (*Calandrella brachydactyla*), Crested Lark (*Galerida cristata*), and Eurasian Skylark (*Alauda arvensis*). Common Kestrel (*Falco tinnunculus*) susceptibility suspected by European Commission (2010) has been positively disproved, at least for breeding populations (Hötker *et al.* 2006, Gove *et al.* 2013). Therefore, **no** cumulative **impact** of displacement **due to operation** is assessed on **most populations nesting**, including priority VECs listed above (species-specific elaboration is provided in Table 9-8). However, there are few possible exceptions whose nesting may be susceptible to displacement to some extent, including priority VECs: Common Quail (*Coturnix coturnix*), Saker Falcon (*Falco cherrug*), and Northern Wheatear (*Oenanthe oenanthe*). Therefore, a more detailed assessment in this respect is considered needed for these species populations and is provided below.

Saker Falcon foraging is susceptible to displacement to some extent, through avoidance behaviour exhibited towards operating WTGs, in particular at large-scale, densely built WPPs (Prommer & Bagyura 2015), such as all within the scope of this Assessment. However, foraging habitats within each WPP site are of negligible value and only for particular resident pair(s), and thus only negligible individual impact on foraging may occur, whilst cumulative impacts can be excluded. Available published sources consider species nesting not susceptible to displacement, since OHL pylons within WPPs are not avoided (Prommer & Bagyura 2015). However, unpublished studies indicate that nests on OHL pylons completely surrounded by large-scale WPPs, and subsequently corresponding home ranges, could be abandoned (S. Puzović 2020, official communication, 25 April, IfNCV). According to current knowledge, of the 15-17 South Banat region breeding pairs, only the resident pair whose home range overlaps with the Kovačica/Pupin WPPs regularly (though not exclusively) nests on OHL pylons that would be completely surrounded by WTGs following the construction of the Pupin WPP, and thus the potential of cumulative effect is low. Nevertheless, considering the small population size of South Banat region, loss of even a single home range would have a significant negative impact at regional and even at the national level, whilst any cumulative effect would likely be exacerbated. However, as in the case of the Čibuk 2 WPP project, through NPCs issued, the IfNCV ensures that any risk of Saker Falcon displacement is / will be prevented, and that any individual and cumulative impact of displacement on species nesting is completely avoided. Considering all the above, **no** cumulative **impact** of displacement **due to operation** is assessed on **Saker Falcon** breeding population **foraging** and **nesting**.

The single source (Pearce-Higgins *et al.* 2009) reports Hen Harrier (*Circus cyaneus*) flight activity to be reduced by ca. 50% within 500 m of operating WTGs. It is noted that these findings may not apply to the South Banat situation, since they relate to a breeding population of the species, non-farmland habitats and by far lower WTG models (height to the hub 30-70 m). However, since susceptibility to displacement is more species- than season-specific and generally higher outside the breeding season in each species (Hötker *et al.* 2006, Gove *et al.* 2013), whilst the population using the habitats within the scope of this Assessment for foraging is considered habituated to intense human activities in the region, it is still considered that these findings could be applicable to this Assessment as well, at least as a worst-case. Since displacement from high WTG models (as in this case) is largely independent of WTG height (Hötker *et al.* 2006), the cumulative effect is considered to be proportional to the total number of WTGs. Based on the sum of 500 m radius area around each of the 552 WTGs, the cumulative effect of displacement from all South Banat WPPs will be 50% reduced flight activity in ca. **8.7%** of the total area. This obviously does not equate to effective loss of habitat and, in particular not population loss or range reduction, though might still locally affect population density and individual birds viability. Considering also that only single individuals of the species occur within any of the South Banat WPP sites, and that larger large unaffected areas of prime foraging habitats are present in the region (such as Deliblato Sands and other Protected Areas) with sufficient capacity to absorb possible negative effects, it is considered that sustainability of the population will not be affected. Therefore, **negligible**, and **not significant**, cumulative **impact** of displacement **due to operation** is assessed on **Hen Harrier** wintering population **foraging**.

The single source (Pearce-Higgins *et al.* 2009) reports Northern Wheatear (*Oenanthe oenanthe*) nesting to be susceptible to displacement within 100 m of the WTGs, but other sources did not find any indication of displacement and even confirm that they habituate to disturbance from WTG operations (e.g. Hötker *et al.* 2006, Gove *et al.* 2013). However, within all of the WPPs for which such information is available, only a single case of suspected nesting was recorded (EcoLogica Urbo 2013), whilst within all the rest, including Čibuk 2 WPP, Northern Wheatear occurs only in an incidental or rare passage, (almost) only outside the breeding season. This is because in the region it nests in grassland habitats (pastures mostly) and exposed loess faces (Šćiban *et al.* 2015), not in arable farmland typical of all WPP sites within the scope of this Assessment. Thus, no impact of displacement on Northern Wheatear was assessed at each individual WPP for which such information is available. Therefore, **no** cumulative **impact** of displacement **due to operation** is assessed on **Northern Wheatear** breeding population **nesting**.

Possible cumulative effects of displacement on the sustainability of Common Quail (*Coturnix coturnix*) breeding population cannot be immediately excluded. Therefore, a detailed assessment of potentially affected population sensitivity to population loss due to displacement is considered needed. In the absence of detailed demographic data for potentially affected populations, the PBR methodology developed by Niel &Lebreton (2005) and Dillingham & Fletcher (2008) was used to estimate the sustainability limits of the potentially affected populations.

Calculated harvest rates for all potentially affected populations are presented inTable9-5, along with maximum cumulative population loss due to displacement, as an equivalent to cumulative habitat loss from displacement (SNH 2012, 2018a, as elaborated below), for direct comparison. It is recognised that population loss from displacement is not likely entirely equivalent to habitat loss but rather lower, though it is taken as such here as a worst-case following precautionary approach. All the details on parameters and all calculations are provided in Appendix C.

The likely effect of displacement on the sustainability of potentially affected population was evaluated by direct comparison of estimated cumulative population loss and harvest rate for the particular (sub)population. Cumulative displacement is considered sustainable when worst-case population loss due to displacement is below the allowable harvest rate, and unsustainable when above maximum harvest rate, whilst any value between would need further investigation (Dillingham & Fletcher 2008).

When the impact of displacement at the lower level of the extent (geographical scale), i.e. on a smaller (sub)population, is evaluated as sustainable, sustainability at the higher scale is ascertained, and mortally rates of larger encompassing population have not been included in Table 9-5 for clearer presentation (although calculated and available in Appendix C).

Table 9-5 Estimated Effect of the Worst-case Cumulative Population Loss from Displacement at the South Banat WPPs on the Sustainability of Potentially Affected Priority VEC Bird Populations

Legend and notes

No. - same as in

Table 7-4, for convenience;

Potentially affected (sub)population - defined by source and character (breeding, migrating or wintering);

Annual harvest rate

h_a = allowable harvest rate (additional human-caused mortality rate likely to be sustainable) - calculated according to Niel &Lebreton (2005) and Dillingham & Fletcher (2008),

h_{max} = maximum harvest rate (maximum mortality rate that could possibly be sustainable) - calculated according to Niel &Lebreton (2005) and Dillingham & Fletcher (2008);

Population loss from displacement - maximal population loss from displacement as an equivalent of habitat loss due to displacement - unsustainable in **red**, sustainable in **blue**.

No.	Species name		Potentially affected (sub-)population	Annual harvest rate (%)		Population loss from displacement (%)
	Scientific	English		h_a	h_{max}	
1	*Coturnix coturnix*	Common Quail	South Banat, breeding	3.91	42.13	1.39

Some sources (e.g. Reichenbach *et al.* 2004) consider Common Quail susceptible to displacement from operating WTGs and assess that breeding/display territories within 200 m of the WTGs may be abandoned. Other sources dispute this based on surveys at operating WPPs (e.g. Möckel & Wiesner 2007) and/or conclude that the species habituates to disturbance from WTG operations (Hötker *et al.* 2006). It is considered that in such cases contradicting findings arose from site-specific issues (Gove *et al.* 2013). The occurring population is already habituated to intense human activities (use of agricultural machinery) throughout the region, and thus it is considered likely that site-and-population-specific risk of displacement is negligible at all WTGs within the scope of the Assessment. Accordingly, no or not significant impact was assessed at each individual WPP for which such information is available. However, Common Quail nesting was recorded in farmland habitats within almost all of the WPPs for which such information is available, and thus cumulative effects, although considered unlikely, cannot be completely excluded. Following precautionary approach only, if 200 m radius area around each of the 552 South Banat WTGs would be effectively lost, this would result in a cumulative loss of 1.39% habitat within the South Banat region, and thus possibly affect the equivalent share of the regional population. The equivalent population loss would be sustainable for regional population (Table 9-5). Considering all the above, the cumulative impact of displacement on **Common Quail** breeding population is assessed as **likely none**, and, only following precautionary approach, *possibly negligible*, and evaluated accordingly as **not significant**.

9.4.4.1.3 Collision mortality

The Čibuk 2 WPP Project does not include a new OHL. Also, no (or not significant at the most) impact of collision mortality from OHLs was assessed from each WPP for which such information is available. Furthermore, most of the new WPP OHLs (where included) are on-site, short and thus with no potential for synergetic and even additive effect. Therefore, any significant cumulative effect can be plausibly excluded, and thus **no** cumulative **impact** of collision mortality **from OHLs** is ascertained.

In contrast, although the not significant impact of collision mortality from WTGs was assessed from each WPP for which such information is available, individual impacts will have an additive effect on regional populations. Therefore, the significant cumulative effect of collision mortality from WTGs cannot be immediately excluded, and thus detailed assessment is considered needed.

Of the 24 species populations identified as priority VECs in this Assessment (Table 9-8), **17** were regarded as **target species** in assessments of those WPPs within the scope of Assessment where NatureScot methodology (SNH 2000, 2017, 2018a) was consistently implemented (and where such information is available). This means that flight activity of these species was recorded in particular details and quantified to enable the prediction of mortality from collision with WTGs using CRM (SNH 2000, 2017, Band *et al*. 2007). Quantified flight activity data and CRM results are available for Čibuk 2 WPP (Table 7-3, Table 12-2) and four more WPPs within the scope of this Assessment: Kovačica 1, Pupin, Čibuk 1, and Plandište. These results are fully compatible since the same methodology (SNH 2000, 2017, 2014a, 2018b, Chamberlain *et al*. 2005, Band *et al.* 2007) was used and consistently implemented in all five. Along with species-specific biometrics which are constant, input variables for SNH collision risk model are site-specific flight activity data, and WTG size and number, and the calculated collision risk is proportional to these. Since the maximum power output of the WPP is directly proportional to WTG size and number, so is collision risk. Therefore, calculated collision risk from each WPP where available was averaged against the WPP maximum power output, to enable extrapolation to all WPP within the scope of the Assessment (or those where collisions of particular species cannot be plausibly excluded based on data on species occurrence). Such extrapolation is considered sufficiently robust, in particular, because the three WPPs, being located in different parts of the South Banat region and different spatial relation to relevant IBAs, can be considered representative of the entire region, and thus their site-specific flight activity data for most of the species as well.

Almost half of these species were only recorded, if at all, in the incidental passage above all of the WPPs, never at blade swept height at the five WPPs where such information is available. These species include: White Stork (*Ciconia ciconia*), Common Snipe (*Gallinago gallinago*), Common Sandpiper (*Actitis hypoleucos*), Western Barn Owl (*Tyto alba*), Short-toed Snake-eagle (*Circaetus gallicus*), Eastern Imperial Eagle (*Aquila heliaca*), Booted Eagle (*Hieraaetus pennatus*), and Long-legged Buzzard (*Buteo rufinus*). Therefore, no risk is predicted for these species using CRM, and no impact of collision mortality from the WTGs on these populations is assessed accordingly from each of the five WPPs for which such information is available. Although incidental collision fatalities of these species cannot be completely excluded over the operational life of all WPP projects, such (potential) additional mortality could not affect their populations at a relevant scale. Therefore, **no** cumulative **impact** of collision mortality **from WTGs** on these **8 species populations** can be ascertained, and these species have not been subjected to further assessment (species-specific elaboration is provided in Table 9-8).

The remaining 9 of these species (Table 9-6) were recorded at blade swept height at the five WPPs where such information is available, at least incidentally. No or not significant impact of collision mortality from the WTGs on all these species populations was assessed from each of the three WPPs. However, since at least some collisions are expected, significant cumulative effects cannot be excluded, and thus detailed quantitative assessment is considered needed. Therefore, latest available CRM results from individual WPPs were extrapolated to relevant spatial scale (South Banat region) to estimate cumulative collision mortality, which is presented in Table 9-6.

Table 9-6 Estimated Cumulative Collision Risk for Priority VEC Target Species from all WPPs within South Banat Region.

Legend and notes

No. - same as in

Table 7-4, for convenience;

Number of birds colliding annually per WPP (MW)
Plandište - from these ESIA surveys (Table 12-2),
Pupin - from Pupin WPP ESIA surveys (Karapandža *et al*. 2021b),
Kovačica - from Kovačica 1 WPP pre-operational surveys (Karapandža *et al.* 2020),
Čibuk 1 - from Čibuk 1 WPP pre-operational surveys (Karapandža & Paunović 2019),
Čibuk 2 - from **Čibuk 2** WPP EIA/ESIA surveys (Karapandža *et al*. 2022b);

Number of birds colliding annually per MW = Sum of number of birds colliding annually at 5 WPP divided by the sum of the 5 WPPs maximum power output (MW);

Cumulative number of birds colliding annually = Number of birds colliding annually per MW multiplied by the total maximum power output (MW) of all WPPs within the South Banat region.

* Not regarded as target species, and thus CRM not undertaken.

No.	Species name		Number of birds colliding annually per WPP					Number of birds colliding annually per MW	Cumulative number of birds colliding annually (2415.6 MW)
	Scientific	English	Plandište (102 MW)	Pupin (95.5 MW)	Kovačica (104.5MW)	Čibuk 1 (157 MW)	Čibuk 2 (155 MW)		
6	*Anser albifrons*	Greater White-fronted Goose	0.00	0.00	2.03	0.00	0.00	0.00331	24.54
42	*Circus aeruginosus*	Western Marsh Harrier	0.15	0.26	0.06	0.20	0.22	0.00146	3.91
43	*Circus cyaneus*	Hen Harrier	0.04	0.09	0.00	0.03	0.07	0.00037	1.10
47	*Accipiter gentilis*	Northern Goshawk	0.00	0.00	0.00	0.01	0.00	0.00001	<0.01
48	*Haliaeetus albicilla*	White-tailed Eagle	0.00	0.00	0.12	0.00	0.00	0.00020	1.45
49	*Milvus migrans*	Black Kite	0.01	0.00	0.00	0.00	0.00	0.00001	<0.01
53	*Merops apiaster*	European Bee-eater	0.00	*	0.00	0.17	1.14	0.00456	25.39
65	*Falco subbuteo*	Eurasian Hobby	0.07	0.00	0.53	0.00	0.00	0.00098	6.41
66	*Falco cherrug*	Saker Falcon	0.06	0.08	0.08	0.00	0.00	0.00035	1.94

None or very low cumulative collision risk (<0.01 collision) is estimated for 2 species populations: Northern Goshawk (*Accipiter gentilis*) and Black Kite (*Milvus migrans*). Although incidental collision fatalities of these species cannot be excluded over the operational life of all WPP projects, such low (potential) additional mortality could not affect their populations even at a relevant scale. Therefore, **no** cumulative **impact** of collision mortality **from WTGs** is assessed for the **Northern Goshawk** and **Black Kite** breeding populations and these species are not subjected to further detailed assessment (species-specific elaboration is provided in Table 9-8).

A potentially significant cumulative impact on the population sustainability of the remaining seven species cannot be immediately excluded. Therefore, a detailed assessment of the potentially affected population sensitivity to additional mortality from collision is considered needed. In the absence of detailed demographic data, the PBR methodology (Niel & Lebreton 2005, Dillingham & Fletcher 2008) was used to estimate the sustainability limits of the potentially affected population.

Calculated harvest rates for all potentially affected populations are presented in Table 9-7, along with estimated cumulative mortality rates from collision, for direct comparison. All the details on parameters and all calculations are provided in Appendix C.

The likely effect of collision mortality on the sustainability of potentially affected populations was evaluated by direct comparison of estimated worst-case mortality rate from collision and harvest rates for the particular (sub)population. Collision mortality is considered sustainable when below the allowable harvest rate, and unsustainable when above maximum harvest rate, whilst any value between would need further investigation (Dillingham & Fletcher 2008).

When collision mortality at the lower level of the extent (geographical scale), i.e. on a smaller, (sub)population, is evaluated as sustainable, sustainability at the higher scale is ascertained, and mortally rates of larger encompassing population have not been included in Table 9-7 for clearer presentation (although calculated and available in Appendix C).

Table 9-7 Estimated Effect of the Cumulative Collision Mortality from All WPPs within South Banat Region on the Sustainability of Potentially Affected Priority VEC Target Species Populations.

Legend and notes

No in column 1. - same as in

Table 7-4, for convenience;

Potentially affected (sub-) population - defined by source and character (breeding, migrating or wintering) ;

Annual harvest rate

h_a = allowable harvest rate (additional human-caused mortality rate likely to be sustainable) - calculated according to Niel &Lebreton (2005) and Dillingham & Fletcher (2008),

h_{max} = maximum harvest rate (maximum mortality rate that could possibly be sustainable) - calculated according to Niel &Lebreton (2005) and Dillingham & Fletcher (2008) ;

from collision = n_c / N_{min} (n_c = number of birds colliding annually, from CRM (Table 12-2) ; N_{min} = conservative population size estimate, calculated according to Dillingham & Fletcher (2008)) - unsustainable in **red**, sustainable in **blue**.

No.	Species name		Potentially affected (sub-)population	Annual mortality rate (%)		
	Scientific	English		h_a	h_{max}	from collision
6	*Anser albifrons*	Greater White-fronted Goose	South Banat, wintering	3.31	11.25	0.04
42	*Circus aeruginosus*	Western Marsh Harrier	South Banat, breeding	2.91	11.01	1.71
43	*Circus cyaneus*	Hen Harrier	Serbia, wintering	0.97	13.22	0.28
47	*Haliaeetus albicilla*	White-tailed Eagle	South Banat, breeding	1.78	6.63	0.80
48	*Merops apiaster*	European Bee-eater	South Banat, breeding	36.95	40.62	0.32
65	*Falco subbuteo*	Eurasian Hobby	South Banat, breeding	13.60	14.95	1.70
66	*Falco cherrug*	Saker Falcon	South Banat, breeding	0.96	10.00	2.66
			Serbia, breeding	0.79	10.00	1.88
			Europe, breeding	0.88	10.00	0.08

The sustainable effect of estimated cumulative collision mortality was predicted on all potentially affected populations of 6 out of 7 assessed species: White-fronted Goose (*Anser albifrons*), Western Marsh Harrier (*Circus aeruginosus*), Hen Harrier (*Circus cyaneus*), White-tailed Eagle (*Haliaeetus albicilla*), European Bee-eater (*Merops apiaster*), and Eurasian Hobby (*Falco subbuteo*). Therefore, **negligible**, and **not significant**, cumulative impact of collision mortality from WTGs on these **6 species** populations is assessed (species-specific elaboration is provided in Table 9-8).

The PBR methodology used indicated possible unsustainability of estimated cumulative collision mortality on potentially affected (sub)populations of Saker Falcon (*Falco cherrug*) at regional and even national level. It should be noted that even when this methodology is used implementing maximum precaution, it may not be appropriate for very small populations (Dillingham & Fletcher 2008), such as the South Banat breeding population of the Saker Falcon. Moreover, in declining populations, in which the recruitment rate is already lower than the mortality rate there is no acceptable additional mortality, since even a smallest increase in mortality only contributes to extinction, and Serbian breeding population of the Saker Falcon is considered to be declining by available published sources (Rajković & Puzović 2018, BirdLife International 2021), Therefore, all the calculated mortality rates in Table 9-7 can only be considered as indicative, not predictive as for the other species. In contrast, Saker Falcon South Banat breeding population, although small is the most viable in Serbia and stable at least (Rajković 2014, Rajković & Puzović 2018). Although the Serbian population had halved between 2003 and 2013, this large decline has mostly stopped or at least decelerated drastically since (Rajković & Puzović 2018), and it is also indicated that mortality from the collision would be sustainable at the current population size. Also, no fatalities of this species have ever been recorded at WPPs in Europe (Dürr 2021b) even when nesting on OHL pylons within WPP and despite the assumed risk for fledglings (Prommer & Bagyura 2015). Moreover, through NPCs issued (as for the Čibuk 2 WPP) and active conservation measures to support species nesting and foraging throughout the region implemented, IfNCV ensures that any individual and cumulative impacts on this species, including collision risk, are avoided or minimised. Effects of the IfNCV preventive approach could not be calculated into collision risk estimates for individual WPPs (which were also extrapolated to assess cumulative effects here), since CRM is based on pre-construction flight activity data, i.e. prior to implementation of any general conservation measures and required project-specific mitigation. Also, estimated cumulative collision risk (Table 9-6) is low by itself, and will be further minimised, and thus any residual effects are not considered likely and even a single fatality can be plausibly excluded. Due to all of the above, the impact of cumulative collision mortality **from WTGs** on **Saker Falcon** resident populations is assessed as **likely none**, and, following precautionary approach only, *possibly moderate negative national*, and evaluated accordingly as likely **not significant**, and *possibly significant negative*.

The remaining **7** species populations identified as priority VECs in this Assessment were **not** regarded as **target species**, and thus their flight activity was not quantified and collision risk was not modelled. Therefore, only qualitative assessment of the impact of collision mortality from WTGs on these species was undertaken at individual WPPs, and thus only qualitative assessment of the cumulative effects was possible as well. These species include: Common Quail (*Coturnix coturnix*), Northern Raven (*Corvus corax*), Sand Martin (*Riparia riparia*), Greater Short-toed Lark (*Calandrella brachydactyla*), Crested Lark (*Galerida cristata*), Eurasian Skylark (*Alauda arvensis*), and Northern Wheatear (*Oenanthe oenanthe*). However, none of these species is considered susceptible to collision with operating WTGs (Langston & Pullan 2003, Hötker*et al.* 2006, European Commission 2010, Gove *et al.* 2013), and very few fatalities, if any, have ever been recorded at WPPs in Europe (Dürr 2021b), which is the reason none of them was considered target species. Furthermore, although rare collisions of single individuals cannot be completely excluded, collisions are considered unlikely, and thus the impact of mortality from collision from WTGs on the sustainability of their populations can be excluded and no or negligible impact was assessed from all individual WPPs for which such information is available. Due to all the above, **no** cumulative **impact** of collision mortality from **WTGs** on these **8 species populations** is plausibly assessed as well.

9.4.4.2 Summary of Species-Specific Impacts

Summary of assessment and evaluation of all potential cumulative impacts of the South Banat region WPP projects on all bird populations of significant nature conservation value (priority VECs) is provided in this section, whilst full elaboration of particular impacts is presented in the section above.

Cumulative impacts that were plausibly excluded for all species/populations, including electrocution mortality and collision mortality from the projects' new OHLs, were not further considered here.

All possible cumulative impacts on all potentially affected bird species populations were assessed as (likely) **none** or **negligible** at relevant scale (South Banat region or higher), and thus **not significant** (Table 9-8). The only possible exception, yet highly unlikely and following precautionary approach only, is the impact of ***cumulative collision mortality*** on ***Saker Falcon resident population*** which is assessed as possibly *moderate negative national*, and thus *possibly significant*.

Table 9-8 Assessment and Evaluation of Possible Cumulative Impacts of the South Banat WPP Projects on Bird Populations

Legend and notes

Populations of significant nature conservation value (priority VECs) are considered individually.

No.- same as in

Table 7-4, for convenience (left blank for species not recorded at the Čibuk 2 WPP site and immediate surroundings);

Population- of significant nature conservation value (identified as priority VEC).

Impacts- magnitude, direction and scale of potential impacts; the numbers in parentheses refer to the justification provided in the text below.

magnitude: major, moderate, minor, negligible, no;
direction: positive, negative;
extent (level): regional (South Banat), national (Serbia), European, global;
evaluation - impacts assessed at the region level or higher are evaluated as **significant**: negative in **red**, positive in **blue**;
() - at the most, following precautionary approach.

No.	Species name		Population	Construction	Operation	
	Scientific	English		Loss of habitat	Displacement	Collision mortality from WTGs
1	*Coturnix coturnix*	Common Quail	Breeding	negligible (1)	likely no (*possibly negligible*) (2)	no (3)
6	*Anser albifrons*	Greater White-fronted Goose	Wintering	no (4)	no (5)	negligible (6)
19	*Ciconia ciconia*	White Stork	Migrating	no (4)	no or negligible (7)	no (8)
	Gallinago gallinago	Common Snipe	Breeding	no (4)	no (9)	no (8)
	Actitis hypoleucos	Common Sandpiper	Breeding	no (4)	no (9)	no (8)
34	*Tyto alba*	Western Barn Owl	Resident	no / negligible (10)	no (11)	no (8)
	Circaetus gallicus	Short-toed Snake-eagle	Breeding	no (4)	no (9)	no (8)
	Aquila heliaca	Eastern Imperial Eagle	Resident	no (4)	no (9)	no (8)
41	*Hieraaetus pennatus*	Booted Eagle	Breeding	no (4)	no (9)	no (8)
42	*Circus aeruginosus*	Western Marsh Harrier	Breeding	no / negligible (10)	no (11)	negligible (6)
43	*Circus cyaneus*	Hen Harrier	Wintering	negligible (10)	negligible (12)	no (6)
47	*Accipiter gentilis*	Northern Goshawk	Breeding	no / negligible (10)	no (11)	negligible (6)
48	*Haliaeetus albicilla*	White-tailed Eagle	Resident	no (4)	no (9)	negligible (6)
49	*Milvus migrans*	Black Kite	Breeding	no (4)	no (9)	no (6)
	Buteo rufinus	Long-legged Buzzard	Resident	no (4)	no (9)	no (8)
53	*Merops apiaster*	European Bee-eater	Breeding	no / negligible (13)	no (14)	negligible (6)
	Falco tinnunculus	Common Kestrel	Breeding	no / negligible (13)	no	high
65	*Falco subbuteo*	Eurasian Hobby	Breeding	no / negligible (10)	no (11)	negligible (6)
66	*Falco cherrug*	Saker Falcon	Resident	no / negligible (13)	no (15)	likely no (*possibly **moderate negative national***) (16)
76	*Corvus corax*	Northern Raven	Resident	no / negligible (13)	no (14)	no (3)
83	*Riparia riparia*	Sand Martin	Breeding	no / negligible (13)	no (14)	no (3)
88	*Calandrella brachydactyla*	Greater Short-toed Lark	Breeding	negligible (1)	no (14)	no (3)
89	*Galerida cristata*	Crested Lark	Resident	negligible (1)	no (14)	no (3)
91	*Alauda arvensis*	Eurasian Skylark	Breeding	negligible (1)	no (14)	no (3)
120	*Oenanthe oenanthe*	Northern Wheatear	Breeding	negligible (1)	no (11)	no (3)
ALL OTHER SPECIES (17)			all	no or negligible	all	no or negligible

(1) Only about 0.08% of the South Banat region farmland habitat used by the species population for nesting and foraging is / will be lost permanently to the construction of WPPs infrastructure, and further 0.02% disturbed temporarily during construction, which is considered negligible.

(2) Most studies find no evidence of displacement at WPPs and clearly demonstrate habituation to disturbance from operating WTGs). The occurring population is already habituated to intense human activities (use of agricultural machinery) in the area. Therefore, it is considered very likely that the site-and-population-specific risk of displacement is low. Although likely site-specific, displacement of Common Quail within 200 m of the operating WTGs was reported by some studies. Nevertheless, even if such displacement would occur throughout the South Banat region WPPs, it would still be clearly sustainable for the potentially affected regional population.

(3) Few fatalities at the most have been recorded at WPPs in Europe. Therefore, it was not identified as target species at any individual South Banat WPP and only qualitative assessment of collision mortality impact has been possible. However, collisions are considered unlikely at each individual WPP (although rare collisions of single individuals cannot be excluded), and thus the impact of cumulative mortality from a collision on the sustainability of the population at any relevant scale can be excluded.

(4) The species population don’t use habitats at any of the WPP sites, commuting or passing over only.

(5) The species population commuting over the WPP sites may only exhibit avoidance behaviour towards WTGs. However, the species is not susceptible to barrier effect from operating WPPs and potentially affected commuting route is used occasionally at the most. Therefore, although parts of the commuting route will likely shift slightly to avoid operating WPPs, the only actual negative effect would be a rare and slight increase in birds’ energy expenditure.

(6) Although some collisions with WTGs are expected, the predicted cumulative mortality from these collisions will be sustainable for potentially affected regional population. The estimated collision risk and consequential mortality rates are expected to further decrease as birds habituate to WPP.

(7) The species is potentially susceptible to barrier effect from operating WPPs. However, the main migration route in the area follows the Danube river valley and cannot be affected. Small migrating flocks occur only rarely above the WPPs closest to Deliblato Sands and DTD Canal, and if this minor alternative route will still be used, the only actual negative effect would be a rare and slight increase in birds’ energy expenditure due to avoidance towards operating WPPs. Even if the birds would be completely and permanently displaced from this minor route, only a negligible share of the migrating population using it would be affected (whist collision risk will be reduced).

(8) The species was never observed at the blade swept height, and thus no collision risk is predicted, and no impact of collision mortality on population is assessed accordingly from each individual WPP for which such information is available. Furthermore, the species occurs at any of the WPPs only rarely or incidentally, if at all, and thus collisions are considered highly unlikely and the least significant collisions can be reliably excluded even cumulatively (although incidental fatalities cannot be completely excluded over the operational life of all WPP projects).

(9) Only single individuals of the species occur at any of the WPPs in a rare or incidental passage, if at all. They may exhibit avoidance behaviour towards WTGs, though the only actual negative effect would be a slight and rare increase in birds’ energy expenditure.

(10) The species population only forages in farmland habitats within the WPPs and does not nest within any WPP site boundary. Only 0.08% of the South Banat region farmland will be lost to WPPs infrastructure, which is considered negligible.

(11) The species population only forages in farmland habitats within the WPPs, and the species foraging is not known to be susceptible to displacement from operating WTGs. The occurring population is already habituated to intense human activities (use of agricultural machinery) in the area. Only a slight increase in birds’ energy expenditure during flights within the WPP sites is expected due to avoidance behaviour towards WTGs, which cannot be considered displacement.

(12) The species foraging is possibly susceptible to displacement from operating WTGs. If the precautionary approach is followed, the flight activity would be reduced by ca. 50% within 500 m of all 552 WTGs, which would equate to ca. 8.7% of the South Banat area. However, considering that only single individuals of the species occur within any WPP, and the presence of large unaffected areas of prime foraging habitats in the region, the impact of displacement would still be sustainable for potentially affected regional population.

(13) The species population forages within most, and nests within some of the WPP sites. No nesting habitats or structures will be affected by any of the projects, whilst none or negligible loss of any optimal foraging

habitat to the WPP infrastructure is expected. Thus, only negligible loss of foraging habitat of high suitability may occur.

(14) Neither species nesting nor foraging is susceptible to displacement from operating WTGs, and occurring population already habituated to intense human activities (use of agricultural machinery) in the area. Only a slight increase in energy expenditure during flights within the WPP sites is expected due to avoidance behaviour towards WTGs, which cannot be considered displacement.

(15) The species only nests on OHL pylons close to (rarely within) some of the WPPs, whilst nesting is possibly susceptible to displacement from operating WTGs. However, the NPCs for each of the WPPs will ensure that any risk of displacement is prevented. Optimal foraging habitat is limited within the WPP so displacement impacts of foraging birds likely to be negligible.

(16) Although low cumulative collisions mortality is predicted, it is still indicated that the effect on potentially affected populations, being very small, would be possibly unsustainable at regional and even national level. However, no fatalities of this species have ever been recorded at WPPs in Europe even when nesting on OHL pylons within WPP and despite the assumed risk for fledglings, the estimated cumulative collision risk is very low and expected to further decrease as birds habituate to WPPs. Furthermore, through NPCs and various active measures, the IfNCV ensures that any individual and cumulative impacts on the species, including collision risk, are avoided or minimised, and thus any residual effects, including even a single collision fatality, are considered highly unlikely.

(17) Any possible cumulative impacts on populations and habitats of not significant nature conservation value (not identified as priority VECs), even if impacts would be likely (and they are not), cannot be significant.

9.4.4.3 Mitigation Measures and Significance of Residual Effects

Since no or not significant cumulative impact on all bird species populations was assessed (or considered very likely), **no additional mitigation**, other than already implemented through the individual projects (and various programmes to support Saker Falcon nesting) and the IfNCV's regular activities, is needed and **no residual effects** can be expected.

However, following the precautionary approach, a particular focus of all WPPs monitoring programmes within the South Banat region should be on species populations identified as priority VECs (Table 9-8). It will be possible to evaluate the likely effects of cumulative collision mortality on the sustainability of potentially affected populations by direct comparison of annual cumulative mortality from the collision as determined by mortality monitoring and particular population sustainability limits, set as Primary Threshold Targets in previous IFC's RCIA (IFC 2019). If Primary Threshold Targets will be exceeded, which is not considered likely, this should inform **adaptive management** of all WPPs within the South Banat region, as well as **joint additional mitigation** according to IFC's RCIA (IFC 2019).

9.4.5 Bats

This ESIA assessed the possible cumulative impacts on all bat species populations occurring within the South Banat region, including loss of habitats, disturbance and fatalities in roosts due to construction, as well as **operational mortality from WTGs**.

The magnitude, direction and scale of potential cumulative impacts were assessed on the basis of expected impacts of individual WPPs, species ecology and susceptibility to potential impacts, and South Banat populations' nature conservation value (IFC 2019), size and other demographics (Appendix C).

9.4.5.1 Potential Impacts

9.4.5.1.1 Loss of habitat

Plandište WPP site is only of the South Banat WPPs (for which such information is available) where a small number of bat roosts was found. All sites lack any mature woodland or built structures that could support the least significant bat roosting, and thus the roosting potential of all sites was plausibly evaluated as negligible, none for larger bat colonies. Therefore, **no** cumulative **impact** on bat **roosting** is ascertained.

This ESIA assessed none or negligible cumulative loss of any habitat to the WPP infrastructure at the South Banat region level (as elaborated in section 9.4.3). Therefore, **no** (or ***negligible*** at the most), and **not significant**, impact of habitat loss on **foraging** and **commuting** is assessed for all species populations (including priority VECs). Species-specific elaboration is provided in Table 9-10.

9.4.5.1.2 Fatalities in roosts

Plandište WPP site is only of the South Banat WPPs (for which such information is available) where a small number of bat roosts was found, whilst the roosting potential of all sites was plausibly evaluated as negligible, none for larger bat colonies, and **no** cumulative **impact** is ascertained..

9.4.5.1.3 Operational mortality

EUROBATS established the concept that "*the most significant impact of operating wind turbines on bats is direct killing, caused due to collision and/ or barotrauma. Migrating bats and bats from local sedentary populations are often killed by wind turbines, sometimes in large numbers*."

Operation of all South Banat WPPs will inevitably cause some bat fatalities. Nevertheless, **if mitigated adequately** none of these WPPs would have significant negative impacts, and thus **no significant negative cumulative impacts** should be expected. However, since the same regional populations will be affected by all WPPs, individual impacts will have an additive effect, and thus the main concern could be the cumulative effects of operational mortality.

The risk of bat operational mortality from operating WTGs cannot be predicted on the basis of the pre-construction surveys activity data in the same way that collision risk modelling is used to predict bird mortality. Therefore, direct quantitative assessment of neither individual nor the cumulative impact of operational mortality is not possible. However, following principles set out by IFC (2013) guidance for RCIA, and implemented for bird populations in previous IFC's South Banat Region Wind Power Projects RCIA (IFC 2019), **sustainability limits** of the potentially affected population (i.e. population-specific mortality thresholds) at relevant scale (regional or higher) were estimated in this Assessment to inform **adaptive management** of the South Banat WPPs, using the PBR method (Niel &Lebreton 2005, Dillingham & Fletcher 2008).

Calculated sustainability limits for all priority VEC populations are presented in Table 9-9. All the details on parameters and all calculations are provided in Appendix C.

Mortality is considered sustainable when it remains below the allowable mortality, and unsustainable when above maximum mortality, whilst any value between would need further investigation (Dillingham & Fletcher 2008).. This means that (cumulative) operational fatalities must not exceed the calculated allowable mortality (M_a in Table9-9).

Table 9-9 Priority VEC Bat Species Populations Sustainability Limits of Cumulative Operational Mortality from All WPPs within South Banat.

Legend and notes

Potentially affected (sub-)population - defined by source and character (resident, migratory);

Annual mortality sustainability limits (number of fatalities):

M_a - allowable harvest (i.e. additional human-caused mortality likely to be sustainable) = h_a x N_{min} [h_a = allowable harvest rate, N_{min} = conservative population size estimate, calculated according to Niel &Lebreton (2005) and Dillingham & Fletcher (2008)];

M_{max} - maximum harvest (maximum mortality rate that could possibly be sustainable) = h_{max} x N_{min} [h_{max} = maximum harvest rate, N_{min} = conservative population size estimate, calculated according to Niel &Lebreton (2005) and Dillingham & Fletcher (2008)].

Species name		Potentially affected (sub-)population	Annual mortality sustainability limits	
Scientific	English		M_a	M_{max}
Pipistrellus pipistrellus	Common Pipistrelle Bat	South Banat, resident	363	860
		Serbia, resident	5852	14757
Pipistrellus kuhlii	Kuhl's Pipistrelle Bat	South Banat, resident	4470	6099
		Serbia, resident	62451	94875
Pipistrellus nathusii	Nathusius' Pipistrelle Bat	South Banat, resident & migratory	352	417
		Serbia, resident & migratory	3030	4604
Hypsugo savii	Savi's Pipistrelle Bat	South Banat, resident	363	430
		Serbia, resident	1826	3278
Eptesicus serotinus	Serotine Bat	South Banat, resident	211	266
		Serbia, resident	2252	3422
Nyctalus leisleri	Leisler's Bat	South Banat, resident & migratory	203	903
		Serbia, resident & migratory	1637	9798
Nyctalus noctula	Noctule Bat	South Banat, resident & migratory	1525	3130
		Serbia, resident & migratory	30504	62597

Considering species ecology and susceptibility to operational mortality from WTGs, regional populations habitat use, activity and abundance within those WPPs for which such information is available, and quite high sustainability limits estimated (Table 9-9), neither population cumulative operational fatalities are considered likely to exceed allowable mortality even at the regional level, whilst sustainability of all national populations is considered ascertained. Therefore, **likely negligible** cumulative **impact** of operational mortality on **all priority VEC species populations** is assessed (species-specific elaboration is provided in Table 9-10).

It is important to note that the bat activity is very likely to increase within all sites boundaries following construction as many bat species are often attracted to WPPs (Rodrigues *et al*. 2015). Even a significant increase in bat population numbers and activity at all sites and following construction, including particularly species considered highly susceptible to operational mortality, is considered possible. Such increase may result in mortality rates which significantly exceed the expectations based on pre-construction surveys, as was recorded by the Mortality Monitoring surveys at some of the South Banat WPPs in. As a precaution, such unpredicted mortality rates must be considered as a possible worst-case, and unsustainable mortality rates can never be completely excluded for any highly susceptible species.

9.4.5.2 Summary of Species-Specific Impacts

Summary of assessment and evaluation of all potential cumulative impacts of the South Banat region WPP projects on all bat populations of significant nature conservation value (priority VECs) is provided in this section, whilst full elaboration of particular impacts is presented in the sections above.

Cumulative impacts that were plausibly excluded for all species/populations, including loss of roost sites and fatalities in roosts, were not further considered here.

All possible cumulative impacts on all potentially affected bat species populations were assessed as (likely) **none** or **negligible** at relevant scale (South Banat region or higher), and thus **not significant** (Table 9-10). The only possible exception, yet unlikely and following precautionary approach only, is the impact of

cumulative operational mortality on ***Nathusius' Pipistrelle*** and ***Leisler's Bat populations*** which is assessed as possibly ***minor negative regional***, and thus *possibly significant*.

Table 9-10 Assessment and Evaluation of Possible Cumulative Impacts of the South Banat WPP Projects on Bat Populations

Legend and notes

Populations of significant nature conservation value (priority VECs) have been considered individually.

Impacts- magnitude, direction and scale of potential impacts; the numbers in parentheses refer to the justification provided in the text below.
magnitude: major, moderate, minor, negligible, no;
direction: positive, negative;
extent (level): regional (South Banat), national (Serbia), European, global;
evaluation - impacts assessed at the region level or higher are evaluated as **significant**: negative in **red**, positive in **blue**;
() - at the most, following precautionary approach.

Species name		Construction		Operation
Scientific	**English**	**Loss of foraging areas**	**Loss/disturbance of flight paths**	**Operational mortality**
Pipistrellus pipistrellus	Common Pipistrelle Bat	no (1)	no (1)	negligible (2)
Pipistrellus kuhlii	Kuhl's Pipistrelle Bat	negligible (3)	negligible (3)	negligible (4)
Pipistrellus nathusii	Nathusius' Pipistrelle Bat	negligible (3)	negligible (3)	likely negligible (*possibly **minor negative regional***) (5)
Hypsugo savii	Savi's Pipistrelle Bat	negligible (3)	negligible (3)	negligible (6)
Eptesicus serotinus	Serotine Bat	negligible (3)	negligible (3)	no (7)
Nyctalus leisleri	Leisler's Bat	no (8)	no (8)	likely negligible (*possibly **minor negative regional***) (9)
Nyctalus noctula	Noctule Bat	no (8)	no (8)	likely negligible (*possibly **minor negative regional***) (10)
ALL OTHER SPECIES (11)		no or negligible	no or negligible	no or negligible

(1) Potentially the least important foraging areas and commuting routes of the species are generically and/or specifically protected and will not be affected by any of the WPPs, whilst farmland habitats and tracks are used rarely at the most.

(2) Species-specific susceptibility to collision is high, one of the highest of all species considering frequent fatalities at WTGs in Europe. However, the activity in developed areas of any WPP site is negligible at the most, and the least important foraging areas and commuting routes of the species were not found within any of the WPPs for which such information is available. Even if species activity would increase within the WPPs following construction, which is considered likely since the species is known to be attracted to WPPs, it would still be low at the most. Therefore, mortality risk is considered low, as well as expected cumulative mortality (unlikely higher than few fatalities annually per WPP), and thus sustainable at any relevant scale.

(3) Only about 0.08% of the South Banat region farmland habitat, used by the species as less important foraging areas, is / will be lost permanently to the construction of WPPs infrastructure, which is considered negligible even at each individual site level. Both commuting and foraging of the species will/may benefit from the development of all WPPs access tracks, though the positive effects will be localised as well.

(4) Species-specific susceptibility to collision is lower than of any other Pipistrelle, probably due to the specifics of their ecology (lower and more direct flight), and such behaviour is considered typical of the species in the region. Commuting routes and foraging areas of the species of at least some importance were identified within all WPPs for which such information is available, as well as high activity, at least occasionally and locally, and is expected to further increase the following construction, since the species is known to be attracted to WPPs and will use developed tracks more. A significant impact of operational mortality was assessed at several WPPs and targeted shutdown of WTGs, conditional or unconditional, was proposed. Considering high activity across the WPPs, some fatalities are inevitable at each of the WPPs, even with mitigation implemented. However, the South Banat regional population is very large and vital, and thus its sustainability limits very high. Therefore, with the WTGs shutdown implemented, the

cumulative mortality would certainly be sustainable even at the regional level, and possibly even in the worst case (without any mitigation implemented).

(5) Species-specific susceptibility to collision is high, one of the highest of all species considering frequent fatalities at WTGs in Europe, and the risk is highest for migratory population. However, mostly resident population of the species was found within the WPPs for which such information is available. Commuting routes and foraging areas of the species of at least some importance were identified within all WPPs for which such information is available, as well as moderate or even high activity, at least occasionally and locally, and is expected to further increase the following construction, since the species is known to be attracted to WPPs and will use developed tracks more. Therefore, significant impact of operational mortality was assessed at most of the WPPs and targeted shutdown of WTGs, conditional or unconditional, was proposed. Considering high species-specific susceptibility, some fatalities are inevitable at each of the WPPs, even with the mitigation implemented. The South Banat regional population is relatively small, and thus its sustainability limits quite low. Therefore, with the WTGs shutdown implemented as proposed, the cumulative mortality would likely be sustainable at the regional level. However, following the precautionary approach, unsustainable cumulative mortality at the regional level cannot be excluded.

(6) Species-specific susceptibility to collision is considered high, though it is not as high as for Pipistrelle species considering less frequent fatalities at WTGs in Europe. Commuting routes and foraging areas of the species of at least some importance were identified within several of the WPPs for which such information is available, and the activity in developed areas of any site is low at the most. Therefore, no significant impact of operational mortality was assessed at any of the WPPs. Even if species activity would increase within the WPPs following construction, which is considered possible since the species is known to be attracted to WPPs, it would still be low at the most. Therefore, mortality risk is considered low, as well as expected cumulative mortality (not higher than few fatalities annually per WPP), and thus sustainable at any relevant scale.

(7) Species-specific susceptibility to collision is medium. Commuting routes and foraging areas of the species of at least some importance were identified within all WPPs for which such information is available, as well as moderate or even high activity, though only occasionally and locally and only at some of the WPPs. Therefore, no significant impact of operational mortality was assessed at most of the WPPs. The activity may increase following construction, since the species may use developed tracks more, though not much since it is not considered to be attracted to WPPs. Therefore, mortality risk is considered low, and expected cumulative mortality even lower (not higher than few fatalities annually, if any, per WPP), and thus sustainability ascertained at any relevant scale.

(8) The species usually forages and commutes in open air space, and thus its foraging areas and commuting routes cannot be the least disturbed.

(9) Species-specific susceptibility to collision is considered high, and the risk is highest for migratory population, though it is not as high as for sibling Noctule Bat considering less frequent fatalities at WTGs in Europe. Commuting routes and foraging areas of the species of at least some importance were identified within most of the WPPs for which such information is available, though mostly negligible activity and resident population of the species. Therefore, no significant impact of operational mortality was assessed at any of the WPPs, and it is considered likely that the cumulative mortality would be sustainable at the regional level. However, since the species is known to be attracted to WPPs, the activity would likely increase within the WPPs following construction. The South Banat regional population is relatively small, and thus its sustainability limits quite low. Therefore, following the precautionary approach, unsustainable cumulative mortality at the regional level cannot be excluded.

(10) Species-specific susceptibility to collision is considered high, one of the highest of all species considering frequent fatalities at WTGs in Europe, and the risk is highest for migratory population. Commuting routes and foraging areas of the species of at least some importance were identified within all of the WPPs for which such information is available, as well as the occurrence of both resident and usually larger migratory (wintering) population. Moderate or even high activity, at least occasionally and locally was recorded within most of the WPPs, and is expected to further increase following construction, since the species is known to be attracted to WPPs. Therefore, significant impact of operational mortality was been assessed at most of the WPPs and targeted shutdown of WTGs, conditional or unconditional, was proposed. Considering high species-specific susceptibility, and even higher for the large migratory population, the most numerous fatalities of all species are expected at each of the WPPs, even with mitigation implemented. The South Banat regional population is relatively large, and thus its sustainability limits high. Therefore, with the WTGs shutdown implemented as proposed, the cumulative mortality would likely be sustainable at the regional level. However, following the precautionary approach, unsustainable cumulative mortality at the regional level cannot be excluded.

(11) Any possible cumulative impacts on populations and habitats of not significant nature conservation value (not identified as priority VECs), even if impacts would be likely (and they are not), cannot be significant.

9.4.5.3 Mitigation Measures and Significance of Residual Effects

Since no or not significant cumulative impact on all bat species populations was assessed (or considered very likely), **no additional mitigation**, other than already implemented through the individual projects, is needed and **no residual effects** can be expected.

However, following the precautionary approach, a particular focus of all WPPs monitoring programmes within the South Banat region should be on species populations identified as priority VECs (Table 9-10). It will be possible to evaluate the likely effects of cumulative operational mortality on the sustainability of potentially affected populations by direct comparison of annual cumulative operational mortality as determined in this Assessment (Table 9-9). If allowable mortality (M_a in Table 9-9) will be exceeded, which is not considered likely, this should inform **adaptive management** of all WPPs within the South Banat region, as well as **joint additional mitigation** according to IFC's RCIA (IFC 2019). Unsustainable cumulative mortality should trigger **additional/adjusted targeted shutdown** of WTGs, though this should be considered on a project-by-project basis and designed based on findings of each WPP mortality monitoring.

9.4.6 Cumulative Landscape and Visual Impact

9.4.6.1 Cumulative Zones of Theoretical Visibility

There are four operational WPPs within 30km of the Čibuk 2 WPP: Čibuk 1 (2km to the north), Elicio Alibunar (18km to the north-east) and Elicio Malibunar (21km to the north-east), Košava (20km to the north-east), and Kovačica (25km to the north-west). The Kostolac WPP (21km to the south-east) is currently under construction. Due to the distance involved (almost 20km or more) and the intervening topography, it is not considered likely that potential significant cumulative effects could arise from the Elicio Alibunar, Elicio Malibunar, Košava, Kostolac, and Kovačica WPPs combined with the Čibuk 2 WPP. These WPPs are therefore excluded from the CLVIA. In order to focus the assessment on potential significant cumulative effects, the operational Čibuk 1 WPP has been included to the CLVIA.

There are four consented WPPs within 30km of the site: the Bela Anta 1 (7km to the north-west), the WindVision Alibunar A&B (16km and 18km to the south-east) and the Kovačica 2 WPP (the second phase of the Kovačica WPP, or "K2", situated 29km to the west). The Bela Anta 1 is currently (at October 2022) in the design redevelopment stage and the Serbian EIA process is yet to be commenced. It is therefore excluded from the CLVIA.

Of the proposed WPPs, the CWP Vetrozelena is the only one which has achieved the ESIA scoping stage (October 2022). The closest Vetrozelena wind turbines have been proposed about 800m north of the Čibuk 2 WPP and about 700m west of the Čibuk 1. The Vetrozelena development programme is similar to Čibuk 2, both are planned to be commissioned in 2025. While the development is at an earlier stage than the consented WindVision Alibunar A&B, it has been considered appropriate to include the Vetrozelena in the assessment, given its proximity to the Čibuk 2 and Čibuk 1 WPPs and the potential to cause significant cumulative landscape and visual impacts.

Information available in the public domain on WindVision Alibunar A&B is based on their pre-2016 planning documents. Given the technological advancement of wind turbines over since 2016, it has been assumed within this assessment that the proposed capacities will be reached with fewer turbines than currently proposed in the planning documents and EIAs. Given that no current turbine configurations are publicly available for these developments, it has not been considered sensible to include their pre-2016 configurations in cumulative ZTV calculations. In order to focus on significant cumulative impacts, i.e. on a local cluster which would emerge as a result of the Čibuk 2 and Vetrozelena development, the WindVision Alibunar A&B has been excluded from the assessment.

A final list of windfarms that have been included in the CLVIA is provided in Table 9-11.

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Table 9-11 WPP Developments Considered in the CLVIA

Name	Status	No. of Turbines	Hub height (m)	Rotor diameter (m)	Tip height (m)	Distance to nearest Čibuk 2 WTG (km)
Čibuk 1	Operational	57	110	120	170	2
CWP Vetrozelena	Proposed	50	165	170	250	0.8

9.4.6.2 Analysis of Cumulative ZTVs

As a starting point, cumulative ZTV maps (CZTV) have been produced to inform the assessment where the three considered WPPs would be visible and where their cumulative visual effects have the potential to overlap. The hub height CZTV map is provided on Figure A5 and the blade tip CZTV map is provided on Figure A6, both in Appendix A.

The CZTVs present the calculated combined theoretical visibility of all three windfarms as well as the additional visibility of various windfarm combinations.

The CZTVs analysis identifies that there would be visibility of all three WPPs in all directions within the Study Area. The Čibuk 2 and Vetrozelena WPPs would add visibility within 5km in a small narrow valley east of Bavanište and within 10km in a valley north-west of Bavanište where there is no view of the Čibuk 1 WPP. Between 10 and 20km, there would be theoretical visibility of all three WPPs from about 60% of the entire area, with obstructed views within the Deliblato Sands and additional visibility of Čibuk 2 and Vetrozelena in the topographically lower areas between Gaj and Dabovic villages (where the existing Čibuk 1 turbine blades are not visible). Beyond 20km, the K2 and K1 WTGs would be visible in the north-west and south-east, north of Pančevo and within the Danube River valley. In reality, it is considered that visibility beyond 20km would be much less as long-distance views would be interrupted by blocks of vegetation or man-made structures. There would be no major difference between the pattern of hub height visibility and the blade tip visibility.

9.4.6.3 Cumulative Landscape Effects

The introduction of the Čibuk 1 and other operational WPPs during 2016-2018 has transformed the landscape of the Study Area. From a solely agricultural landscape it became an agricultural landscape with occasional WPPs. However, there are not enough WTGs for the area for them to be considered as a characteristic of the area.

The addition of the Čibuk 2 and Vetrozelena WPPs would increase the presence of WTGs around Dolovo and Mramorak villages to the point where they will become a defining characteristic of the area (see Figure 9-3). The three WPPs would create a local turbine cluster where wind turbines appear as a dominant local characteristic. Out to about 5km from each WPP the landscape would be changed from ‘landscape with occasional windfarms’ to ‘windfarm landscape’. As the distance from the area increases, out to about 10km from each WPP, the presence of turbines would decrease, and the level of effect would be reduced to a ‘landscape with windfarms’. WPPs would remain one of the characteristics of the area but would not be sufficiently dominant to become the key characteristic. In the wider landscape context of the South Banat Loess Plateau LCA, the landscape would remain the one with occasional WPPs where WPPS are seen as separated features, too infrequent to become a characteristic of the area.

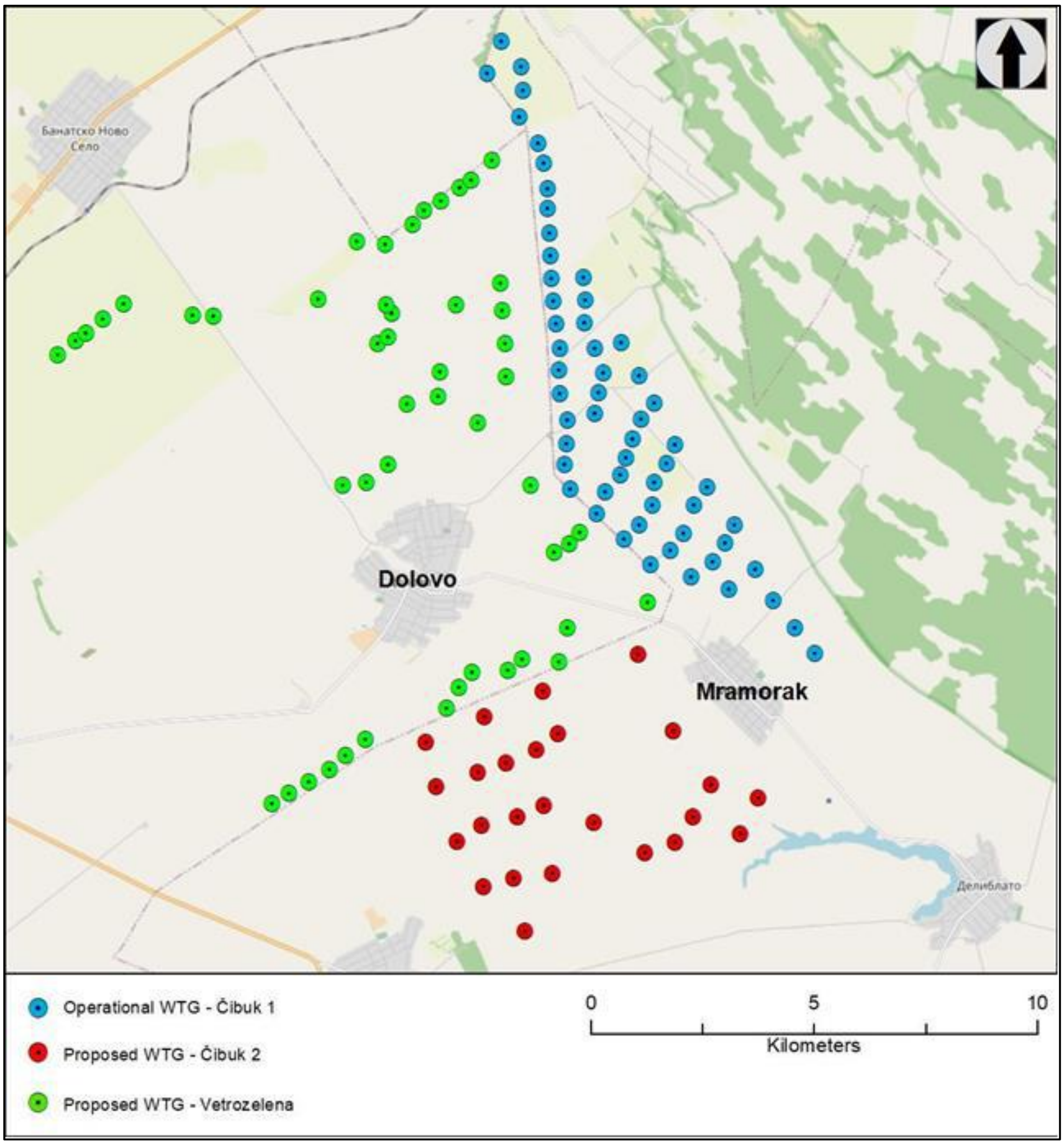


Figure 9-3 WTG Locations for Vetrozelena, C1 and C2

During the fieldwork, it was found that all three WPPs could be seen simultaneously but that the Čibuk 1 would be slightly less prominent than Čibuk 2 and Vetrozelena, due to its smaller turbines. As a consequence of their similar scale, Čibuk 2 and Vetrozelena would frequently appear as one development. The addition of Čibuk 2 WPP would widen the visual impact towards the south (Bavanište) where the existing Čibuk 1 WPP has not been prominent or noticeable. The addition of the Vetrozelena WPP would mostly increase the WPP influence in the area between the Čibuk 1 and Čibuk 2, i.e. between Dolovo and Mramorak villages.

Given the flat, large-scale landscape of the Study Area, all three WPPs would appear relatively uniform and consistent in scale and form. They would be mostly seen in the same landscape settings, affecting only one landscape character – agricultural fields without distinctive boundaries between them. Due to their relatively regular shape, the three layouts would form a triple or quadruple line at similar elevations. Depending on direction, in some views the Čibuk 2 and Vetrozelena turbines would appear seemingly ordered but in others would partially overlap. However, the existing landscape has a simple form and is low sensitive to large-scale windfarms. The turbines would not create a high contrast with the existing landscape features and the degree of integration into the open agricultural fields would be high.

The scale of incremental change is judged to be medium – the landscape receptor has been already impacted by wind energy development and the Čibuk 2 and Vetrozelena would additionally contribute to the overall effect and sense of WPPs in the area. All three WPPs would be located in the same landscape context. They would relate consistently to the key landscape characteristic – open agricultural fields, achieving the balance with the undeveloped open landscape. The geographical extent is judged to be medium – the three WPPs would have an effect a moderate geographical extent within a widely present South Banat Loess Plateau LCA. The cumulative magnitude of change to the landscape is assessed to be high in the immediate landscape around Dolovo and Mramorak (low sensitive landscape receptor), resulting in a **moderate adverse cumulative effect**. Seen from the wider landscape context, the cumulative magnitude of change in the wider South Banat landscape is considered to be low, resulting in a **minor adverse cumulative effect**.

9.4.6.4 Cumulative Visual Effects

During the fieldwork and selection of viewpoints for the cumulative assessment, one of the key considerations was to identify areas of concurrent visibility of all considered WPPs, i.e. where the observer is able to see two or more developments from one viewpoint within one angle of view. The other consideration were areas where the observer has to turn to see the various WPPs from the same viewpoint (successive views). Sequential views where the observer has to move through the landscape to be able to see two or more developments at the same time were considered along the roads.

A summary of the cumulative visual effects of the introduction of the Čibuk 2 WPP and what would be the in-combination and in-succession effects with the two other considered developments (Čibuk 1, Vetrozelena) is provided in Table 9-12 below.

Table 9-12 Summary of Cumulative Visual Effects

Type of Receptor	Sensitivity	Description of Impact	Significance of Impact
Settlements within 5km of the development site			
Dolovo, Mramorak, Bavanište		The cumulative visual impact would be caused by combined visibility of the three WPPs, particularly from the edges of the settlements. The Čibuk 2 and Vetrozelena turbines would be intervisible while the Čibuk 1 would mostly be seen in succession with them. Within Dolovo and Mramorak villages, when views are not screened by intervening vegetation or buildings, the Čibuk 2 and Vetrozelena turbines would be seen in a close distance. The turbines would appear as one development, evenly spaced, without major stacking or overlapping. Both villages would be surrounded by wind turbines, and only views to the east (from Dolovo) and to the south (from Mramorak) would remain unaffected. The scale of change is judged to be large and the geographical extent would be large as the turbines would be seen from many viewpoints. This would result in a high magnitude of cumulative change. Taking account of the high receptor sensitivity this will constitute **major adverse** visual effect. Refer to Photomontage B1, B2, B3 (Appendix B). Many views within Bavanište village would be obstructed by intervening vegetation and buildings. The Čibuk 2 turbines would mostly be visible from the western and northern outskirts of the village. The Vetrozelena turbines would appear slightly smaller but still as part of the Čibuk 2 development. The Čibuk 1 turbines are visible in a long-distance (more than 10km) and are not that noticeable. The scale of change is judged to be medium as many views from Bavanište would remain unaffected. The geographical extent would be scattered and judged to be mid-range. This would result in a medium magnitude of cumulative change. Taking account of the high	Major to Moderate adverse

Type of Receptor	Sensitivity	Description of Impact	Significance of Impact
		receptor sensitivity this will constitute **moderate adverse** visual effect. Refer to Photomontage B4 (Appendix B).	
Settlements between 5 and 10km of the development site			
Deliblato, Skorenovac, Gaj, Kovin.	High	The cumulative visual impact would be caused by combined visibility of the three WPPs from the edges of the settlements. Many views from these areas would be screened by the landform, buildings or vegetation. The Čibuk 2 and Vetrozelena would be seen in a middle-distance and would mostly occupy the left half of the views from these settlements. The Čibuk 1 appears in the right half and is less noticeable, due to the smaller scale of its turbines and greater distance (c. 10km). The Čibuk 2 and Vetrozelena turbines would be seen as a regularly shaped group. The scale of change is judged to be medium to small as the turbines would affect the medium to small proportion of the available field of view. The geographical extent is judged to be scattered and mid-range. The addition of the Čibuk 2 and Vetrozelena WPPs would result in a cumulative change of medium magnitude and **moderate to minor adverse** visual effect. Refer to Photomontage B6, B8, B10 (Appendix B).	Moderate to Minor adverse
Travellers on local roads			
Travellers on local municipal roads connecting Dolovo, Mramorak, and Deliblato and state road No. 134 connecting Kovin, Gaj and the Deliblato Sands.	Medium	Travelling between Pančevo and Dolovo, Dolovo and Mramorak, and Mramorak and Deliblato, the Čibuk 2 and Vetrozelena turbines would be clearly noticeable and prominent, although views would be filtered by the line of roadside trees, resulting in a medium to high magnitude of visual impact. The cumulative visual impact would be caused by the combined visibility of the three WPPs. The successive views would be rare. Refer to Photomontage B1, B2, B3 (Appendix B). Travelling along the road No. 134 from Kovin to Gaj and further to the Deliblato Sands, the Čibuk 2 and Vetrozelena turbines would be seen in a middle-distance as a regularly shaped group set against the skyline. They would occupy the left half of the view and would appear more prominent than the existing Čibuk 1 which occupies the right half of the view. The scale of the cumulative change is considered to be medium too small for travellers on these roads. The geographical extent is judged to be medium. The overall magnitude of change is medium to low and taking account of the medium receptor sensitivity will result in moderate to minor adverse cumulative visual effect. Refer to Photomontages B1, B3, B6, B8, B10 (Appendix B).	Moderate to Minor adverse

Type of Receptor	Sensitivity	Description of Impact	Significance of Impact
Travellers on regional routes No. 10 and No. 14			
Travellers on route No. 10 from Pančevo to Vršac and on route No. 14 from Pančevo to Kovin.	Low	Travellers on the road No. 10 are currently minor affected by adverse visual effects from the Čibuk 1 which is seen in a long-distance, frequently obstructed by road vegetation. The addition of the Vetrozelena to these views would result in a medium magnitude of change and minor adverse cumulative visual effect. The Čibuk 2 visibility would be mostly limited to blade tips. Travellers on the road No. 14 would be moderately affected by adverse visual effects from the Čibuk 2 and Vetrozelena which would be seen in a medium-distance, frequently obstructed by road vegetation. The turbines would appear evenly spaced, without major stacking or overlapping. The operational Čibuk 1 is not prominent in these views due to the distance involved (more than 12km). This would result in a medium magnitude of change and minor adverse cumulative visual effect. Refer to Photomontage B7, B9, B10, B11 (Appendix B).	Minor adverse
People involved in Recreational Activity			
Fishermen and other visitors to the Kraljevac Reservoir	Medium	Many views from the Kraljevac area would be screened by the landform or vegetation and the turbines would be mostly visible from the higher ground areas around the reservoir. The Čibuk 2 and Vetrozelena WPPs would appear as a compact group in the westerly views. The turbines would mostly appear consistent in height and evenly spaced, with no major overlapping. The Čibuk 1 visibility is limited to blade tips due to the intervening landform. The cumulative visual change is judged to be medium scale. The geographical extent is judged to be small. The overall magnitude of change would be medium to low. Given the medium sensitivity of receptors, the visual effect would be **minor adverse**. Refer to Photomontage B5 (Appendix B).	Minor adverse
People in work (agricultural, infrastructure)			
Various	Low	People working in the fields around Dolovo and Mramorak have views of the operational Čibuk 2 WPP. The introduction of the Čibuk 2 and Vetrozelena would extend the turbines presence to the areas of Bavanište and Deliblato and increase the turbines presence around Mramorak and Dolovo. Within 5km of the Čibuk 2 site there would be a high magnitude visual impact and **moderate adverse effect**. Beyond 5km from the site, there would be a visual impact of low magnitude and thus **minor adverse effect**. Beyond 10km from the site, the effect would become **negligible**. Refer to Photomontage B1, B7, B10 (Appendix B).	Moderate adverse – negligible adverse

9.4.7 Cumulative Shadow Flicker

To determine the potential for cumulative shadow flicker from the Čibuk 2, Vetrozelena WPP and the existing Čibuk 1 WPP, a cumulative Study Area has been calculated (1,600m of the Čibuk 2, 1,700m of the Vetrozelena and 1,200m of the Čibuk 1). Any receptor situated within the overlapping zone of the three Study Areas has been considered to potentially experience the flickering effect.

There are 33 receptors (properties) within the overlapping zone of which c. 25 receptors are permanently occupied residential houses. The remaining structures are storage sheds or dilapidated houses and one receptor is a crop warehouse.

The positions of the cumulative shadow flicker receptors are shown in yellow on Figure 9-4.

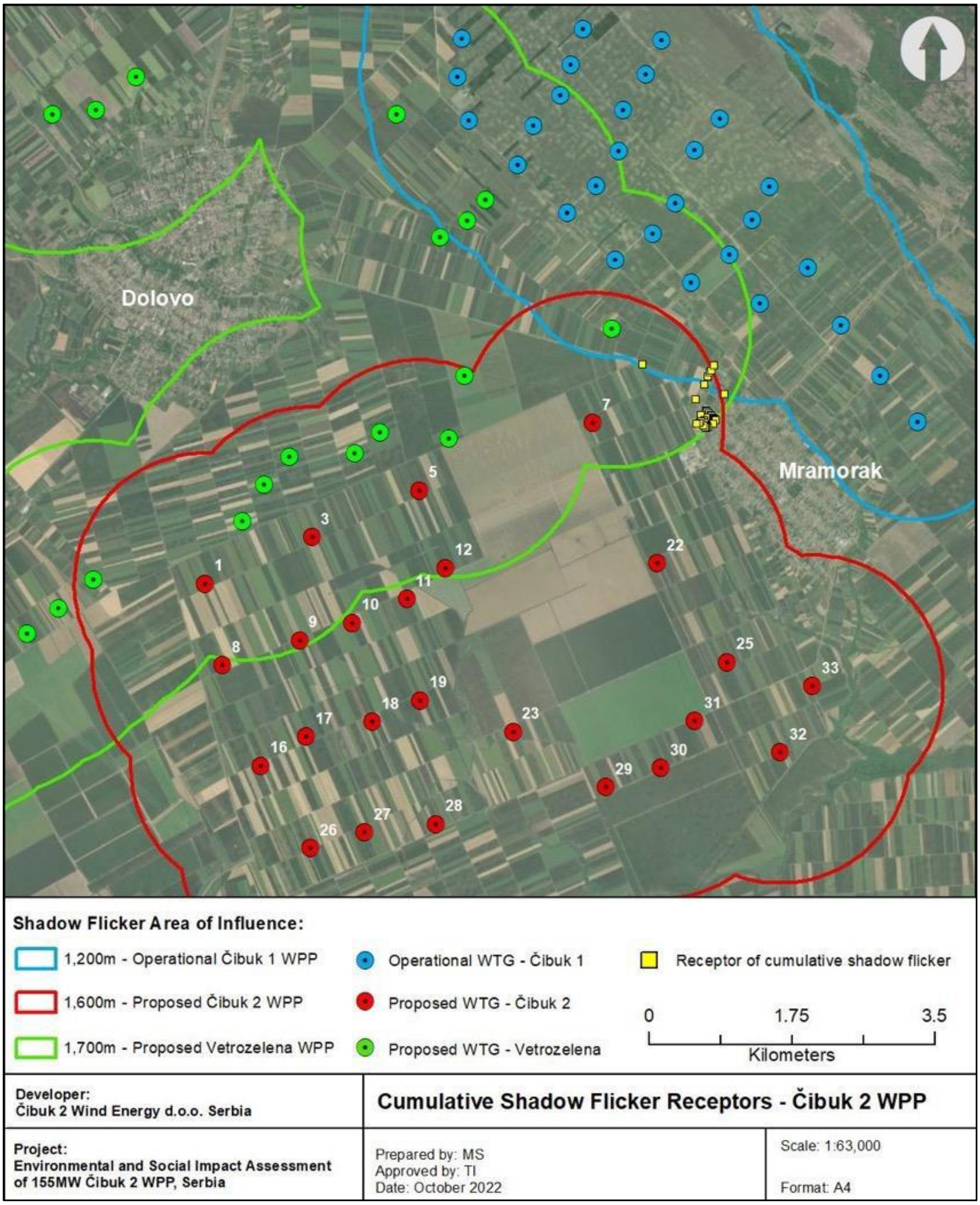


Figure 9-4 Cumulative Shadow Flicker Study Area

9.4.7.1 Modelling Results

The cumulative worst-case model calculation has been run on the same input variables, assumptions and methodology applied for the Čibuk 2 WPP shadow flicker impact assessment.

The theoretical cumulative shadow flicker calculation predicts that a total of 9 receptors would be effected, of which 4 are permanently occupied residential houses, 3 are dilapidated houses and 2 are crop warehouse and barn. Four receptors would be affected by both the exceedance of the annual recommended threshold of 30 hours/annum and the daily threshold (30 minutes/day). Five receptors would be affected only by the exceedance of the daily threshold limit (30 minutes/day). The results of the cumulative shadow flicker model are shown on Figure 9-5.

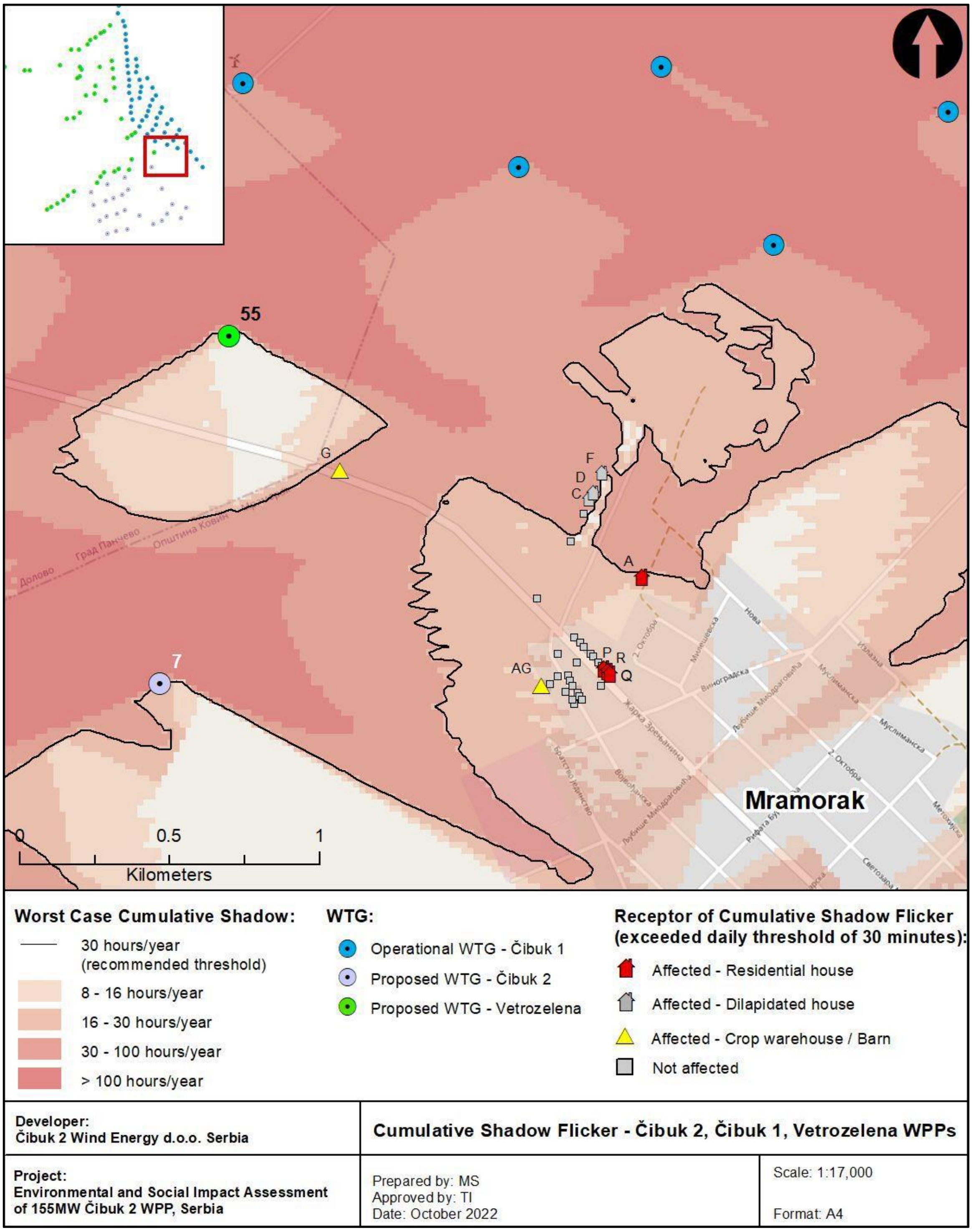


Figure 9-5 Cumulative Shadow Flicker Model

The list of receptors predicted to be effected by the cumulative flickering effect is show in Table 9-13. The complete calculation results are provided in Appendix E Cumulative Shadow Flicker Report.

Table 9-13 Cumulative Shadow Flicker Model Results

No.	Receptor	Coordinates (UTM 34 N)		Cumulative Shadow Flicker Duration		Season and Period of Day
		Easting	Northing	[hours/ annum]	[minutes/ day]	
1.	Residential house (A)	497,032	4,970,750	25:45	0:32	June - July (5-6am) June - July (7-8pm) March, October (4-5pm) April, September (6-7am)
2.	Residential house (P)	496,904	4,970,446	14:17	0:34	April, September (5-7pm) April - May (6am) September - October (6am)
3.	Residential house (Q)	496,916	4,970,436	14:14	0:33	April, September (5-7pm) April - May (6am) September - October (6am)
4.	Residential house (R)	496,925	4,970,428	13:59	0:33	April, September (5-7pm) April - May (6am) September - October (6am)
5.	Dilapidated house (C)	496,834	4,970,962	45:35	0:31	June - July (7-8pm) March, October (4-5pm) May, August (6am)
6.	Dilapidated house (D)	496,856	4,971,012	52:42	0:31	
7.	Dilapidated house (F)	496,899	4,971,097	43:53	0:36	
8.	Crop warehouse (G)	496,025	4,971,108	39:54	0:35	June - July (5-6am) December - January (2-3pm)
9.	Barn (AG)	496,693	4,970,390	17:13	0:31	April, September (6-7pm) April, August (6am)

The assessment was based on a conservative estimate (sunshine intensity will always cause flicker, wind turbines are in constant operation, turbine blades are always facing the receptors, etc.) and no account was taken of typically less sunlight in autumn and winter months. It is therefore considered that the actual amount of shadow flickering is likely to be much less.

The contribution of each WPP to the cumulative shadow flicker at each receptor is shown in Table 9-14. The data is indicating that the residential house ‘A’ would be slightly more affected by the Vetrozelena WPP than the Čibuk 2 on an annual basis. The receptor already receives about 8 hours/annum from the Čibuk 1 operation. The residential houses ‘P’, ‘Q’, and ‘R’ are currently slightly affected by the Čibuk 1 and the Čibuk 2 would increase the amount of shadow flicker above the daily threshold. The dilapidated structures (‘C’, ‘D’, ‘F’) would be predominantly affected by the Vetrozelena WPP.

Table 9-14 Cumulative Shadow Flicker Caused by each WPP

No.	Receptor	Coordinates (UTM 34 N)		Amount of Shadow Flicker caused by each WPP					
				Čibuk 2 WPP		Čibuk 1 WPP		Vetrozelena WPP	
		Easting	Northing	[hours/ annum]	[min/ day]	[hours/ annum]	[min/ day]	[hours/ annum]	[min/ day]
1.	Residential house (A)	497,032	4,970,750	7:47	0:23	8:17	0:12	9:41	0:20
2.	Residential house (R)	496,925	4,970,428	10:36	0:26	3:23	0:12	0:00	0:00
3.	Residential house (P)	496,904	4,970,446	10:58	0:27	3:19	0:12	0:00	0:00
4.	Residential house (Q)	496,916	4,970,436	10:51	0:26	3:23	0:12	0:00	0:00
5.	Dilapidated house (C)	496,834	4,970,962	10:52	0:26	6:50	0:16	27:53	0:31
6.	Dilapidated house (D)	496,856	4,971,012	10:34	0:26	6:52	0:16	35:16	0:31
7.	Dilapidated house (F)	496,899	4,971,097	10:03	0:24	7:25	0:17	26:25	0:30
8.	Crop warehouse (G)	496,025	4,971,108	20:49	0:35	19:05	0:22	0:00	0:00
9.	Barn (AG)	496,693	4,970,390	15:43	0:31	1:30	0:09	0:00	0:00

The residential house ‘A’ is shown on Figure 9-6.

Figure 9-6 Residential House ‘A’ – Cumulative Shadow Flicker Receptor

Permanently occupied houses are considered to be high sensitive receptors, therefore the shadow flicker impact on houses ‘A’, ‘P’, ‘Q’, and ‘R’ is **significant**.

Dilapidated houses are considered to be a low sensitive receptor, therefore the shadow flicker impact is **not significant**.

Industrial structures are considered to be a low sensitive receptor, therefore the shadow flicker impact on the crop warehouse and barn is **not significant**.

The cumulative shadow flicker impact assessment and related mitigation is further discussed in Section 12.5 Shadow Flicker during Operation.

9.4.8 Cumulative Impact on Transport and Traffic during Construction

The construction programme of Čibuk 2 WPP has the potential to coincide with the programme of the proposed Vetrozelena WPP and the consented WPPs Alibunar A&B and Kovačica 2 ("Pupin").

The worst-case cumulative scenario would be that

- All five WPPs use the Port of Pančevo as a delivery point for large turbine components,
- the turbine delivery periods fully overlap, and
- the peak period traffic flows for transportation of other construction materials overlap as well.

It is of note that the Port of Pančevo has a limited capacity to off-load and store large turbine components. Also, the number of potential contractors for abnormal load transport is limited in the region and it is very likely that at least two WPP developers are likely to use the same contractor. This is likely to put certain restrictions and prevent the significant overlap of turbine delivery activities.

The transportation route used for all five WPPs would be a 4km-long section of the road No. 10 from the Port of Pančevo, through the suburban city area to the northern exit from the city. As already noted, the road is a dual carriageway, class Ib state road along the entire route through the city. It has high traffic flows of almost 26,000 vehicles per day (more than 1,000 HGVs). Upon reaching the Pančevo North, the transportation routes would separate, vehicles for the Kovačica 2 WPP would continue northbound towards Crepaja, vehicles for the Alibunar A&B and Vetrozelena WPPs to Vladimirovac while the route for the Čibuk 2 would continue eastbound to Bavanište. The transportation route is shown in Figure 9-7.

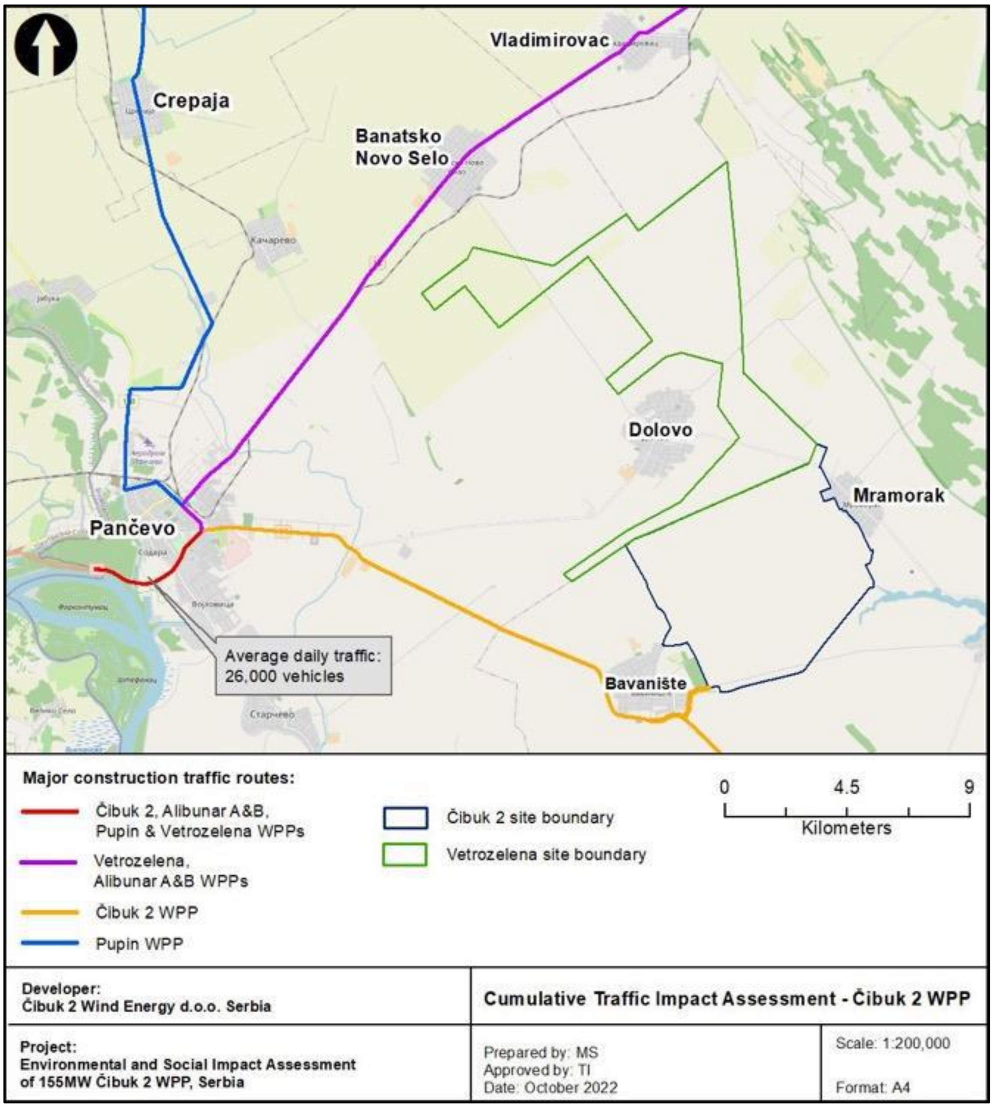


Figure 9-7 Cumulative Impact on Transport

The current daily traffic flow of HGVs along the road is 1,062. To exceed the IEMA Guidelines threshold of 30% increase in HGVs traffic flow, the cumulative daily number of HGVs for the WPPs should reach at least 318. During the peak traffic periods between 12.30pm and 3.30pm this might contribute to the existing slight congestion. However, the road No. 10 is a receptor of low sensitivity constructed to accommodate HGV movements between regional destinations. The potential short-term increase would be well within the capacity of the road. The significance of any cumulative effects is therefore considered to be **minor adverse** and can be readily mitigated through the implementation of the CTMPs of individual WPPs.

The same route from the Pančevo Port through Pančevo was used in 2017-2019 during the construction of the operational windfarms (Kovačica, Čibuk 1, Alibunar) when convoys usually left Pančevo between 6am and 6:30am. No significant congestion and delays in Pančevo were reported at the time.

9.4.9 Cumulative Noise Impacts

For this assessment, operational noise from the existing Čibuk 1 WPP was considered together with Čibuk 2 as the noise limits will apply to all wind turbines in the area. However, there are other proposed WPPs in the area as identified in Table 9-4. Of these Vetrozelena would have a potentially significant impact especially in Dolovo as the Vetrozelena scheme could have up to 50 turbines which would almost encircle the village (see Figure 9-8). The proposed scheme could result in turbines between Čibuk 1 and Dolovo, and between the Čibuk 2 and Dolovo. Therefore, if consented, it is likely that Vetrozelena WPP, rather than Čibuk 1 and Čibuk 2 would determine wind turbine noise levels around Dolovo.

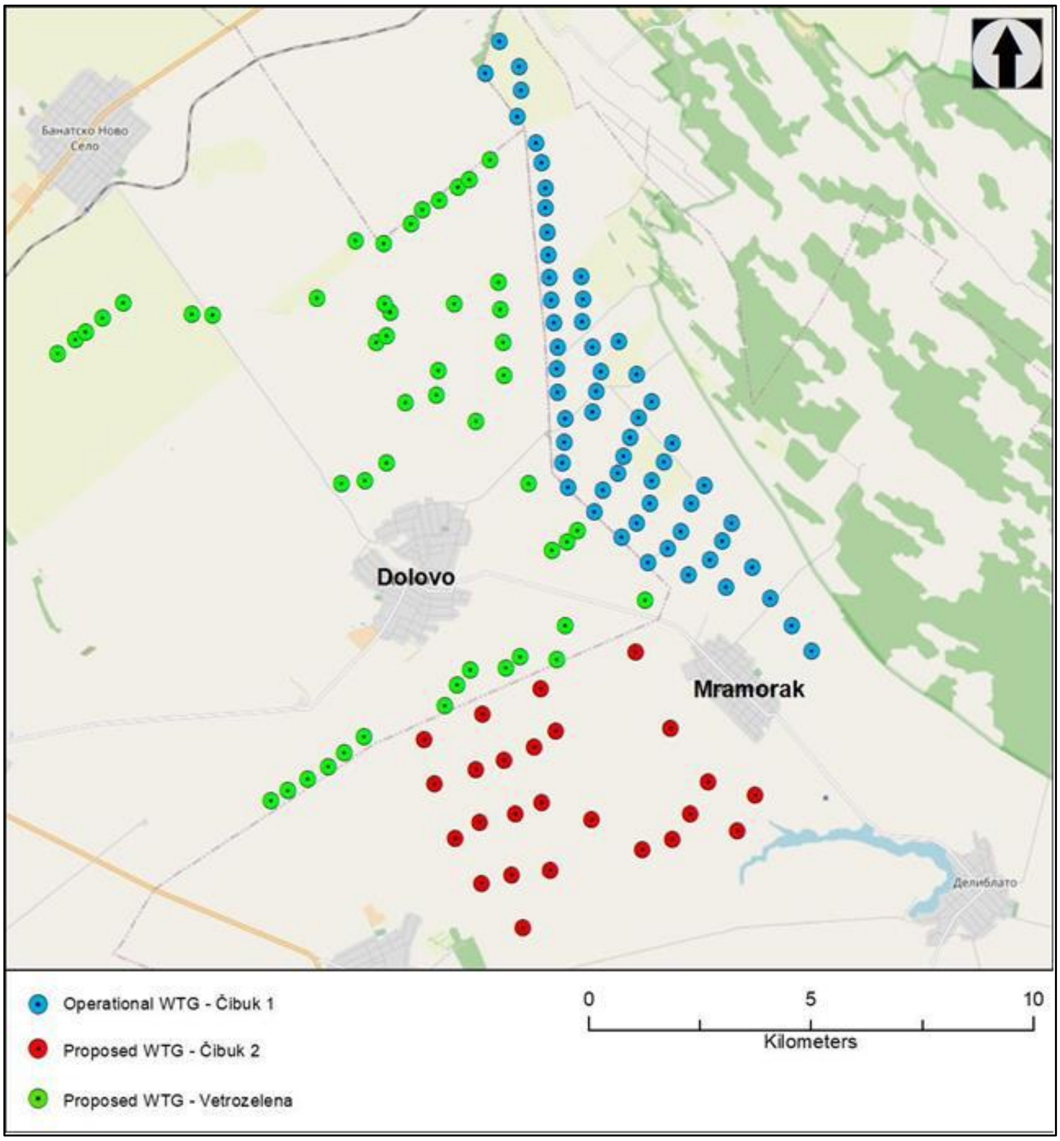


Figure 9-8 WTG Locations for Vetrozelena, C1 and C2

The Vetrozelena scheme is at Scoping Study stage and therefore may change, or may not progress at all, to ESIA. However, to carry out an initial assessment, it is possible to predict noise levels for the scoping layout using the same turbine assumption as for Čibuk 2 (see section 12.6). The predicted noise levels for all of the Vetrozelena turbines operating at rated power are shown below. Cumulative noise levels for all three wind turbines operating are provided in Figure 9.2.

Table 9-15 Predicted Noise Levels from the proposed Vetrozelena WPP

Location	Name	Receptor Co-ordinates (UTM)		Predicted Noise Level at Rated Power (dB LAeq)
		Easting	Northing	
1A	Mramorak East	497689	4970557	30.3
1B	Mramorak East	498516	4969523	27.0
1C	Mramorak West	496690	4970673	34.6
1D	Mramorak West	497086	4969394	30.0
1E	Mramorak South	498108	4968407	26.6
3A	Dolovo	491716	4973138	37.5
3B	Dolovo	491438	4971199	39.3
3C	Dolovo	490686	4970629	39.6
7	North-east of Čibuk 1	496361	4977152	42.8
8	North-east of Čibuk 1	497899	4975157	26.0
8A	North-east of Čibuk 1	499565	4972609	26.5
8B	North-east of Čibuk 1	499284	4972923	30.1
9	On road north-east of Dolovo	492834	4974763	28.2
10A	Dolovo South	488590	4969427	38.9
10B	Dolovo South	488134	4969169	39.2
11A	Bavaniste	490824	4964906	29.3
11B	Bavaniste	490502	4964415	28.6
11C	Bavaniste	491644	4963759	26.4
11D	Bavaniste	492382	4962423	23.8
11E	Bavaniste	491545	4962726	24.7
12	Summer House	495812	4964368	24.2
13A	Deliblato	502481	4965817	19.5
13B	Deliblato	501512	4964526	19.5
14	House in Woods	501666	4969788	22.2

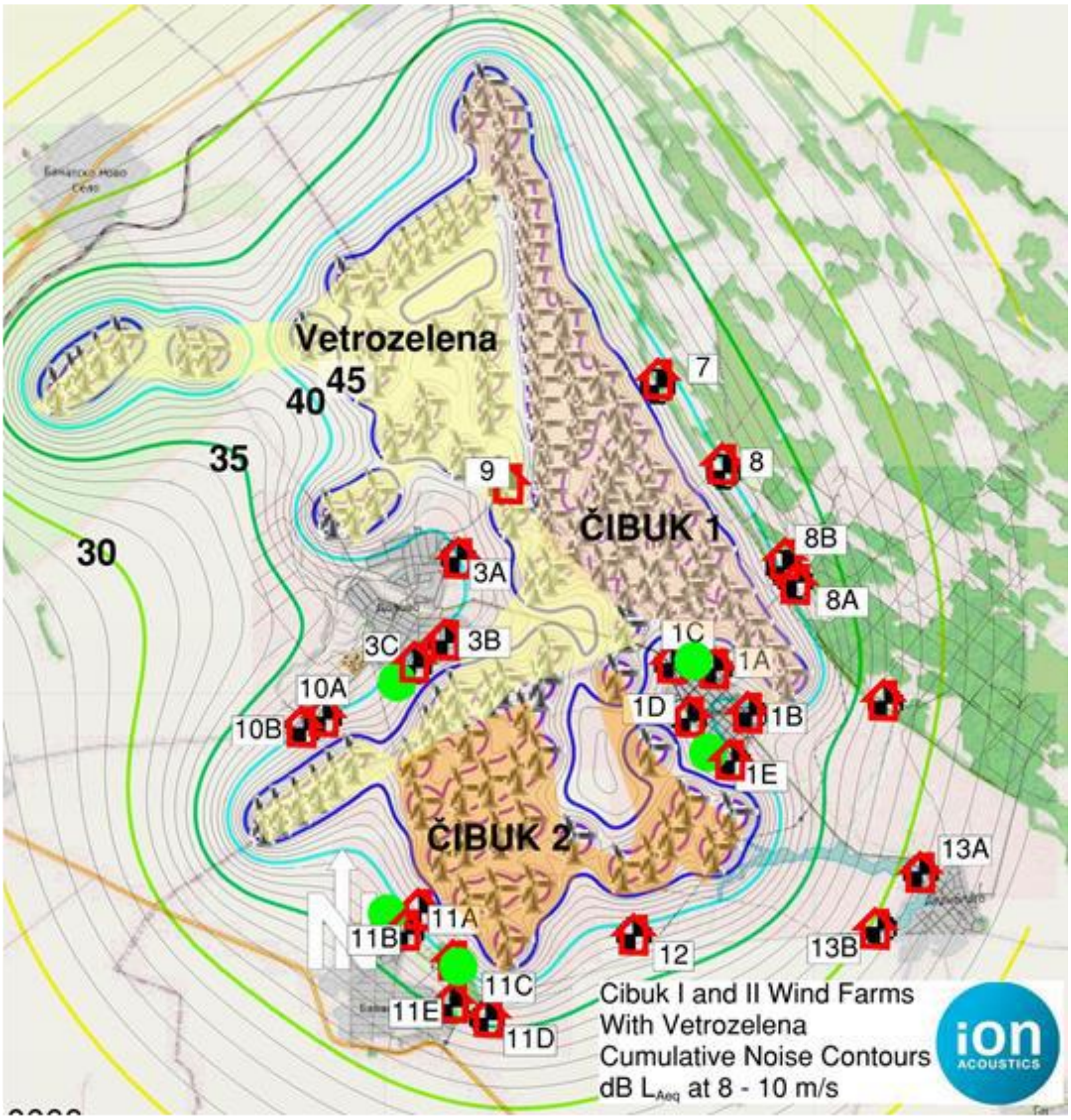


Figure 9-9 Cumulative Noise Contours (Čibuk 1, Čibuk 2 and Vetrozelena)

9.5 Transboundary Impact

No significant transboundary impacts on biodiversity are expected. Although some long-distance migratory populations of bird and bat species occur in the WPP site area, the ESIA concluded only negligible impact at the most on any of them.

10 Impact Significance and Mitigation Framework

10.1 Assessing Impacts and Opportunities

The impact of the Project, as well as the possible opportunities resulting from the Project, were considered and assessed by technical experts with professional experience of other wind power projects. Many of these experts are based in Serbia and are fully aware of the technical (GIIP) and legal constraints that must be met.

Wherever possible, a quantitative assessment of the impacts was undertaken, i.e. by comparison with appropriate legal requirements and GIIP standards. Where this was not possible, a qualitative assessment of impacts was undertaken, i.e. professional judgements were made.

There are a number of ways to determine the significance of impacts. These include methods for scoring and ranking impacts on the basis of subjective criteria. Results are often presented in the form of a matrix in which importance and magnitude of impact are combined into a significance score. When using a matrix approach, it can be less easy to make a clear distinction between evidence-based and value-based judgements so that decision makers and other stakeholders are aware of the level of subjective evaluation that has been used. The CIEEM Guidelines avoid and discourage use of the matrix approach and categorisation and make it clear that the suggested approach should be used only where categorisation has been specifically required. Spurious quantification should be avoided where cannot be a clear definition of the criteria and thresholds that underpin them are not used.

In summary, the impact assessment process adopted within the Čibuk 2 ESIA involves:

- Identifying and characterising impacts and their effects.
- Incorporating measures to avoid and mitigate negative impacts and effects.
- Assessing the significance of any residual effects after mitigation.
- Identifying appropriate compensation measures to offset significant residual effects.

The assessment of impacts takes into account the baseline conditions to allow:

- A description of how the baseline conditions will change as a result of the Project and associated activities.
- The identification of cumulative impacts arising from the proposal and other relevant developments.

A significant impact is simply an effect that is sufficiently important to require assessment and reporting so that the decision maker is adequately informed of the consequences of supporting or permitting a project. A significant impact is a positive or negative impact that should be given weight in judging whether to authorise a project: it can influence whether permission is given or refused and, if given, whether the effect is important enough to warrant conditions, restrictions or further requirements such as monitoring. A significant impact does not necessarily equate to an impact so severe that consent or support for the project should be refused.

The subsequent evaluation of the significant impacts includes the subjective consideration of:

- Sensitivity of receiving environment;
- Extent and magnitude of the impact;
- Reversibility and duration of the impact;
- Inter-relationship between impacts; and
- Type and extent of cumulative impacts.

Positive and negative impacts are considered according to whether the change is:

- Positive (an “opportunity”) – a change that improves the quality of the environment or provides a benefit to project stakeholders e.g. by extending habitat or improving water quality, or opportunities local employment, tax income or improved farmland tracks. This may also include halting or slowing an existing decline in the quality of the environment or stakeholder values.
- Negative (a “detriment”) – a change which reduces the quality of the environment e.g., destruction of habitat, removal of foraging habitat, habitat fragmentation, pollution or has an impact on health, welfare, wellbeing of project stakeholders, e.g., the loss of land, livelihood or property.

The assessment of each impact or opportunity is complex and the likely significance of impacts is based upon the judgement of the technical experts. These individuals considered the importance or sensitivity of the affected receptor(s) and the nature and magnitude of the predicted changes. For example, a moderate negative effect on a feature or site of low importance is considered to be of lower significance than the same effect on a feature or site of high importance. The sensitivity of the receptor depends upon the relative importance of existing environmental features on or in the vicinity of the site or the sensitivity of receptors. The criteria for determining sensitivity or importance are based on existing guidance, legislation, statutory designation and professional judgement. Significance is a function of the sensitivity of the receptor and the extent or magnitude of the impact.

Short-term impacts typically relate to the construction and decommissioning periods. Impacts lasting less than the life of the Project are considered to be medium-term whilst those over or exceeding the life of the Project are considered long term. The reversibility of an impact, either wholly, or in part, in the short to medium term, were also considered where relevant. Following the assessment of receptor sensitivity, the potential impact on a receptor and the predicted magnitude of that change or impact was identified, i.e. the scale or degree to which the existing environment may be changed.

The technical specialists applied the general definitions presented in the following tables (Table 10-1, Table 10-2, and Table 10-3).

Table 10-1 Criteria for Impact Duration

Duration of the Impact	Criteria Adopted by the Impact Assessment
Temporary - Short Term	Impact continues during construction and up to 1 year following construction
Temporary – Medium Term	Impact continues for 1 to 5 years following construction
Temporary – Long Term	Impact continues for 5 to 10 years following construction
Permanent	Impact continues for more than 10 years following construction

Table 10-2 Criteria for Receptor Sensitivity

Sensitivity of the Receptor	Criteria Adopted by the Impact Assessment
High	Site or species subject to international or national protection
Medium	Site or species subject to regional or local protection
Low	Site or species subject to no specific protection measures
Negligible	Site or habitat already significantly degraded

Table 10-3 General Criteria for Extent and Magnitude of an Effect

Extent and Magnitude of Effect	Criteria Adopted by the Impact Assessment
High	Fundamental change to the specific environmental conditions assessed resulting in long term or permanent change
Medium	Noticeable change to the specific environmental conditions assessed resulting in non-fundamental temporary or permanent change
Low	Detectable but minor change to the specific environmental conditions assessed
Negligible	No discernible change to the specific environmental conditions assessed

Cumulative impacts are those that result from the incremental impact of the project when added to other existing, planned and reasonably predictable future projects and developments. While a single activity may itself result in an insignificant impact, it may when combined with other activities within the project AoI result in a cumulative impact that is significant.

The assessment of cumulative impacts is often restricted by the availability of reliable information. The rapid cumulative impact assessment adopted in this ESIA involves a combination of desk-based research and engagement with stakeholders.

10.2 Mitigation Framework

Following the assessment of the impacts identified, the technical experts considered appropriate mitigation measures that might prevent, reduce or remedy any potentially significant environmental impacts. Such measures may be implemented during design, construction and operation of the proposed development.

The development of mitigation measures was guided by the mitigation hierarchy (see Figure 10-1, below) presented in IFC guidelines. The general principles are:

- *Having identified the impact, can it be avoided?*
- *If not, can the impact be minimised by modification to the project design or through on-site operational measures.*
- *When impacts are unavoidable, or if on-site mitigation is not possible then the impact may be compensated by offsetting through off-site improvement works. When offsetting then the minimum objective should be no net loss or reduction in environmental quality.*

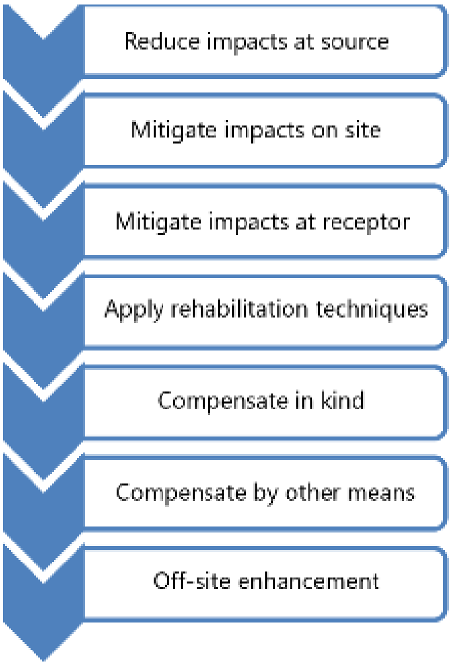


Figure 10-1 Mitigation Hierarchy

For each impact identified during the impact assessment the ESIA may recommend:

1. Remove the source of the impact to:
   - Avoid certain projects or elements that could result in adverse impacts;
   - avoid areas that are environmentally sensitive; and
   - putting in place preventative measures to stop adverse impacts from occurring.
2. Minimise the impact, i.e. to limit or reduce the degree, extent, magnitude, or duration of adverse impacts by:
   - Scaling down the proposal;

- redesigning elements of the project; and
- taking supplementary measures to manage the impacts.

3. Rehabilitation, i.e. mitigate unavoidable residual adverse impacts by:
   - Habitat restoration/ enhancement;
   - Species relocation; or
   - following closure of the project restoring the site or environment to its previous state or better.
4. Impact compensation, i.e. provide for off-site enhancement that matches or exceeds the negative impact of the project by:
   - Provision of replacement land at an alternative location to compensate for loss of farmland (i.e., in-kind);
   - compensation equal to the lost revenue experienced as a result of the project;
   - replacement of the same resource values at another location, for example, by habitat improvement to provide an equivalent area to that lost.

10.3 Residual Impact

Following the identification of mitigation measures to address significant adverse impacts, an assessment of the significance of any residual effects (i.e. those remaining after mitigation) was completed. Where significant residual impacts remain, consideration has been given to offsetting or compensating for residual impacts.

The scale of the 'Residual Impact', i.e. once the mitigation measures have been applied, has been summarised as a simple graduate scale from positive benefits down to negative impacts as follows:

- Substantial Beneficial
- Moderate Beneficial
- Minor Beneficial
- Negligible Beneficial

Benefit

- No Change

- Negligible Adverse
- Minor Adverse
- Moderate Adverse
- Significant Adverse

Disbenefit

10.4 Linking Impacts, Mitigations and Management Plans

The environmental and social impacts identified during the assessment, the proposed mitigations and a scale of the residual impact has been recorded, in tabular form, within Chapters 11, 12, 13, and 14.

The mitigation and monitoring measures recommended by the technical experts have been summarised within the Environmental and Social Management and Monitoring Plan ("ESMMP"), see Section 15.1.2. The ESMMP will then be used to develop the ESMS management plans, see Section 15.1.

11 Construction - Impact Assessment and Mitigations

11.1 Introduction

This Chapter describes the assessment and mitigation of the construction impacts identified within the Scoping Study. The impact topics are presented in the order of significance identified by the Scoping Study. A summary of the impacts identified and recommended mitigation or control measures are presented in one or more tables at the end of each topic section. These impacts, mitigations and control measures are consolidated in a single table in Chapter 16. The Construction impact summary table (see section 14.2) is linked to the Environmental and Social Monitoring and Management Plan (ESMMP) presented in Chapter 17. The ESMMP will be used as the basis of the Construction Environmental and Social Management Plan (CESMP). The CESMP will include a series of subsidiary, topic specific Management Plans (see Chapter 15) that will describe the procedures and controls required to manage the impacts in line with the Project Applicable Requirements (see section 2.7).

The Scoping Study categorised the construction impacts of Čibuk 2 as:

Significance Level One Issues

- Ecology and Nature Conservation – potential impact on birds;
- Ecology and Nature Conservation – potential impact on bats;

Significance Level Two Issues

- Socio-economic;
- Traffic and Transport;

Significance Level Three Issues

- Ecology and Nature Conservation – potential impacts on habitats and species other than birds and bats;
- Noise;
- Archaeology and Cultural Heritage;
- Surface Water and Effluent;
- Land and Groundwater;
- Aviation Safety and Radars Obstructions;
- Electromagnetic Interference and Telecommunication;
- Ecosystem Services;
- Climate Change;
- Air Quality;
- Community Health, Safety and Security.

11.2 Ecology and Nature Conservation

This section identifies, characterises and evaluates the potential construction impacts of the Čibuk 2WPP project on ecological features of significant nature conservation value, identifies and describes mitigation measures needed as well as provides an assessment of the significance of any residual effects.

Only those ecological features considered to be potentially affected by the project and of significant nature conservation value should be subject to detailed impact assessment (CIEEM 2016). For ecological features of not significant nature conservation value (valued at the local level at the most), no detailed impact assessment is needed (CIEEM 2016, SNH 2018a) since any potential impact could only be not significant as well (CIEEM 2016, European Commission 2020).

It is noted that the Appendices of this ESIA contain the data from the surveys and the output of any modelling that was undertaken. The conclusions presented below are based upon the consideration of the survey findings and the outcome of the modelling.

11.2.1 Assessment of Impacts

11.2.1.1 Designated Sites

This ESIA has assessed the possible **direct impacts** on designated sites within the WPP site, including habitat loss and degradation, which is presented in this section.

Possible **indirect impacts**, on flora and fauna species populations of the designated sites within the vicinity of site are presented in following sections, where applicable.

The magnitude, direction and scale of potential impacts on habitats have been assessed on the basis of the nature conservation value of designated sites and their possible exposure and susceptibility to the potential impact.

11.2.1.1.1 Kraljevac SNR / Deliblato Sands IBA

Primary Mitigation already adopted within the Zoning Plan ensures that habitats of the designated site located along the WPP site boundary (Figure 7-11, sections 7.3.2.1.2, 7.3.2.1.1) will not be destructed or degraded. Therefore, **no** direct **impact** is ascertained.

11.2.1.1.2 Woodland/scrub, marshland and wetland fragments and canals

Primary Mitigation already adopted within the Zoning Plan ensures that none of the generically protected woodland/scrub, marshland and wetland fragments or canals, including two segments designated as Ecological Corridors of Local Importance, within the site boundary will be destructed or degraded. Therefore, **no** direct **impact** is ascertained.

11.2.1.1.3 All Other Designated Sites

All other designated sites are situated distinctly beyond the site boundary (Figure 7-11) and there will be no destruction or degradation of any designated sites as a consequence of the construction or associated activities. Therefore, **no** direct **impact** is ascertained.

11.2.1.2 Habitats

This ESIA has assessed the possible **direct impacts** on all habitats within the WPP site including destruction and degradation, which is presented in this section. Possible indirect impacts, on occurring flora and fauna species populations, in particular on birds and bats, are presented in following sections. The magnitude, direction and scale of potential impacts on habitats have been assessed on the basis of the nature conservation value, abundance and spatial distribution of habitat types and their possible exposure and susceptibility to the potential impact.

The impact of the introduction of invasive species is not considered as it must be prevented under Law.

None of the habitat types within the site boundary are of significant nature conservation value (none as such, major local at the most for certain species). Therefore, any potential direct impact on habitats could only be **not significant** as well.

11.2.1.2.1 Farmland

Up to **0.35%** (15.94 out of total 4593.97 ha) of the farmland within the site boundary will be **lost** to the WPP infrastructure: WTGs' foundations and platforms (5.25 ha), new tracks (2.13 ha), and widening of existing tracks (8.56 ha). This loss will be permanent (for the operational life of the Project), though reversible if restored properly during decommission. Additional area of farmland around each WTG, up to **0.11%** (5.25 ha) total, will likely be **disturbed/lost temporarily** during the construction. Considering such small magnitude of the impact even at the site level and insignificant nature conservation value of this habitat type (none as such, major local at the most for certain species, see section 0), the impact is assessed as **negligible**, and **not significant**.

11.2.1.2.2 Tracks and ruderal vegetation

About **28.1%** (42.8 out of total 152.4 km) of the farm tracks within the site boundary will be widened and paved during the WPP construction, and thus modified. This impact will be **permanent** (for the operational life of the Project), though **reversible** even if not restored during decommission (ruderal vegetation will spontaneously grow again when maintenance ends).

For **birds**, such modification cannot be considered habitat loss or destruction, but only as a ***slight degradation*** at the most. This is because tracks' functionality for birds will largely be preserved (open grounds for displaying, retained rainwater for drinking, dust for dust-baths), and even improved in certain aspects (being kept vegetation-free), whilst only food and nesting resources for some of the species will be slightly negatively affected (due to loss of ruderal vegetation). Considering the magnitude of the impact and insignificant nature conservation value of this habitat type (none as such, moderate local at the most for certain species, see section 7.3.3.5), the impact is assessed as **negligible**, and **not significant**.

For **bats**, modification of tracks cannot be considered habitat loss, destruction or even degradation, since tracks' functionality for bats will be preserved (concentration of potential prey, open grounds enabling hunting for the species that collect their prey from the ground, retained rainwater for drinking). Functionality will even be improved in certain aspects as the developed tracks will be even more distinctive within surrounding fields which will **benefit** the commuting of all Pipistrelle Bat species. Therefore, considering the magnitude of the impact and insignificant nature conservation value of these this habitat type (none as such, major local at the most for certain species, see section 7.3.3.5), the impact is assessed as **negligible** to **minor positive local** (depending on the species), and **not significant**.

11.2.1.2.3 Vertical loess faces

The largest of the three small vertical loess faces within the site (Figure 7-18, section 7.3.3.6) is located on the side of the roadcut of the existing farm track that will be developed into the site access track. If the existing farm track will be widened at the expense of these features, about **50%** of the vertical loess faces area within the site, would be **lost** to site access tracks. Considering the magnitude of the impact and insignificant nature conservation value of these features (major local for certain species), the impact is assessed as **moderate local**, and **not significant**.

11.2.1.2.4 Woodland/scrub, marshland, wetland and canals

Primary Mitigation already adopted within the Zoning Plan ensures that none of the areas of semi-natural habitats and canals within the site boundary will be destructed or degraded by the WPP construction. Therefore, **no** direct **impact** is ascertained.

Only sparse individual elements of semi-natural vegetation located on the verges of the existing farm track that will be developed into the site access track could be lost to site access tracks if existing farm tracks will be widened in particular areas. Therefore, considering very small possible magnitude of the impact and insignificant nature conservation value of these features (minor local at the most for certain species, see section 7.3.3.3), the impact is assessed as **negligible**, and **not significant**.

11.2.1.3 Flora and Fauna

The majority of flora and fauna, excluding birds and bats, species populations and their habitats within the site boundary are of insignificant nature conservation value (valued at the local level at the most, see section 0). Therefore, any potential impact could only be **not significant** as well.

Illegal activities, such as deliberate destruction of protected flora species individuals /populations and deliberate killing of protected fauna species (including destruction of nests/ roosts/ lairs/ habitations, eggs and litters), are not considered, since they must be prevented under Law. However, as nationally strictly protected species are present (*i.e.* four invertebrate species and two amphibian species appropriate precautionary mitigation measures will be adhered to during construction to ensure that if any species of conservation concern occur within areas impacted by construction are not impacted.

11.2.1.4 Birds

This ESIA assessed the possible impacts on all bird species populations occurring within the site boundary including the loss of habitats to construction, as well as displacement and mortality in nests due to construction.

The magnitude, direction and scale of potential impacts were assessed based on occurring populations' nature conservation value (Table 7-5), ecological status (

Table 7-4) and size (Table 7-1, Table 7-2) within the site, as well as species ecology and susceptibility to potential impacts, and encompassing populations' size and other demographics (Appendix C).

Illegal activities, such as deliberate killing of protected bird species (including destruction of nests and eggs), are not considered, since they must be prevented under Law.

11.2.1.4.1 Loss of habitat

This ESIA assessed none or negligible loss of any habitat to the WPP infrastructure even at the site level (as elaborated in section 11.2.1.2). Considering also insignificant nature conservation value of the habitats within the site for most occurring bird populations (valued only at the local level at the most, Table 7-5), **no** (or ***negligible*** at the most), and **not significant**, impact is assessed for all species populations (including those of significant nature conservation value). Species from the adjacent IBA have the potential to be impacted at a site level and accordingly detailed mitigation methods to ensure no net loss of IBA populations are included in the mitigation section.

11.2.1.4.2 Displacement

Construction displacement is where birds are excluded from the areas of the WPP site and its surrounding, that were suitable for them before construction takes place (SNH 2017, 2018a).

Most of the bird populations using the habitats within the site for nesting and/or foraging are already habituated to constant human presence and intense activities in the area, including the use of agricultural machinery in particular, and not very susceptible to the disturbance that will be caused by construction. Furthermore, construction works will be carried out gradually, only one or a few WTG at a time, and only a small part of the entire site will be exposed to disturbance at any time. Although construction may cause some localised and short-term disturbance, this cannot be considered displacement. Therefore, **no impact** is assessed for all bird species populations (including those of significant nature conservation value).

11.2.1.4.3 Mortality in nests

Mortality in nests due to accidental/incidental damage or destruction of a nest or nest site could occur through vegetation removal and/or earthworks during construction.

Primary Mitigation already adopted within the Zoning Plan ensures that all of the areas of woodland/scrub, marshland, and wetland habitats, as well as canals and OHLs within the site boundary are excluded from development. Therefore, **no impact** is ascertained for all bird species populations nesting in these habitats/features, including species notified within the adjacent IBA that also nest on the WPP site: Red-backed Shrike (*Lanius collurio*) and Barred Warbler (*Curruca nisoria*). Despite the low likelihood of construction impacts on nesting species associated with the adjacent IBA precautionary mitigation methods to ensure no net loss of IBA populations are included in the mitigation section.

Only farmland and tracks within the site are included in development, and only species nesting in these habitats could be exposed to mortality in nests These are ground-nesting species and species nesting in ruderal vegetation along the tracks, such as most of the occurring the birds, mostly small passerines including populations of significant nature conservation value of Common Quail (*Coturnix coturnix*), European Stonechat (*Saxicola rubicola*), and Tawny Pipit (*Anthus campestris*). However, only a small percentage of the farmland within the site will be developed or disturbed by the construction (see section 11.2.1.2.1), and only an equivalent share of these species populations could be exposed to mortality in nests in worst case. Considering such small magnitude of the impact even at the site level, the impact is assessed as **negligible**, and **not significant**, for these species as well.

One of the three vertical loess faces within the site (yellow arrow 1 on Figure 7-18) is formed on the roadcut of the farm track which will be developed into the site track. Small colonies of European Bee-eater (*Merops apiaster*) and Sand Martin (*Riparia riparia*) nest in this loess face. Any earthworks on this loess face in breeding season would cause damage or destruction of nests and consequential mortality (destruction of eggs or fatalities of unfledged juveniles). Although populations nesting there are not of significant nature conservation value, since this a known nesting site of Strictly Protected Species, destruction of nests whilst birds/eggs are present within cannot be considered accidental/incidental and **must be prevented** under Law. Given European Bee-eater (*Merops apiaster*) are listed as a reason for designation of the adjacent IBA recreation of the vertical loess face being lost will take place on site to provide nesting habitat.

11.2.1.5 Bats

This ESIA assessed the possible impacts on all bat species populations occurring within the site boundary, including loss of habitats, disturbance and fatalities in roosts due to construction.

The magnitude, direction and scale of potential impacts were assessed based on occurring populations' nature conservation value (Table 7-8), ecological status (Table 7-7, Figure 7-25) and size (**Table 12-4**) within the site, as well as species ecology and susceptibility to potential impacts, and encompassing populations' size and other demographics (Appendix C).

11.2.1.5.1 Disturbance

Turmoil, vibrations, noise, and lighting from construction can cause bat disturbance. However, localised disturbance from construction could only be significant where it is close to roosts, in particular during maternity and hibernation season. This risk is increased if the construction works are carried out at night using lighting, as roosting of all species is susceptible to disturbance from lighting, as well foraging and commuting of some species.

There are no bat roosts within the site, whilst Primary Mitigation already adopted within the Zoning Plan ensures that the majority of important foraging areas and commuting routes within the site is excluded from development. Therefore, the areas where the site-specific risk of bat disturbance would be the highest are already avoided.

Only a share of foraging areas and commuting routes and only of light-opportunistic species (which exploiting lighting for foraging) (Voigt *et al.* 2018) are present in developed areas of the site. This means that only if construction work would be undertaken at night, which is not likely, only commuting could be adversely affected. Moreover, construction works will be carried out gradually, only one or a few WTG at a time, and thus only a small part of the entire site will be exposed to a disturbance at any time.

The ESIA concludes that there could only be localised and short-term disturbance in periods and areas of none or negligible susceptibility. Therefore, **no impact** is assessed for all bat species populations (including those of significant nature conservation value).

11.2.1.5.2 Loss of habitat

Primary Mitigation already adopted within the Zoning Plan ensures that the majority of important foraging areas and commuting routes within the site is excluded from development. Moreover, this ESIA assessed none or negligible loss of any habitat to the WPP infrastructure even at the site level (as elaborated in section 11.2.1.2). Considering also insignificant nature conservation value of the habitats within the site for all occurring bat populations (valued only at the local level at the most), **no** (or ***negligible*** at the most), and **not significant**, impact is assessed for all species populations (including those of significant nature conservation value).

11.2.1.5.3 Mortality in roosts

There are no bat roosts within the site and **no impact** is ascertained for all bat species populations (including those of significant nature conservation value).

11.2.2 Proposed Mitigation/ Control Measures and Significance of Residual Impacts

Primary Mitigation of the potential impacts on habitats, flora and fauna was achieved through design changes of the WPP layout, which are already adopted within the Zoning Plan. These changes provided a comprehensive set of measures to avoid and minimise negative effects of the Project on various ecological features.

The Primary Mitigation, along with adherence to legal requirements, NPCs and generic GIIP implemented through ESMMP, will ensure that all potential negative impacts of the Project on any ecological features are avoided or minimised, and the ESIA concludes that only **not significant** negative **residual** effects could occur.

11.2.2.1 General measures

There are certain legal obligations imposed by the Law on Nature Protection (Official Journal of RS, No. 36/2009, 88/2010, 91/2010 - *correction*, 14/2016, 71/2021) which are listed in the ESMMP and whose enforcement must be ensured through the CESMP.

1. The following activities are strictly prohibited by the Law, and must be prevented (even though their potential impacts would be negligible):
    - Deliberate picking, collecting, cutting, uprooting or destruction of Protected and Strictly Protected plants and fungi (including medicinal herbs, decorative plants, wild fruits and berries, mushrooms etc.);
    - Deliberate capture or killing of specimens of Protected and Strictly Protected animal species (including collecting snails, poaching of game and birds etc.);

- Deliberate disturbance of Protected and Strictly Protected animal species, particularly during the period of breeding, rearing, hibernation and migration;
- Deliberate destruction or taking of eggs.

2. It is essential that work must stop in that area, the IfNCV must be contacted immediately and their instructions implemented in the event of:
   - Any violation of the above,
   - Incidental killing or injuring of Protected and Strictly Protected species,
   - Discoveries of any Protected and Strictly Protected species (including particularly nests, roosts and lairs) at the site.
3. Prevention of introduction, and eradication and suppression of invasive alien species (e.g. *Acer negundo, Ambrosia artemisiifolia*, *Amorpha fruticosa, Robinia pseudoacacia, Ailanthus altissima, Fraxinus americana, Fraxinus pennsylvanica, Celtis occidentalis, Ulmus pumila, Prunus padus, Prunus serotina*, *Sorghum halepense,*) is both legally binding for all landowners and users in Serbia, as well as explicitly required by the NPCs and by the IFIs “where feasible” and should be implemented through the CESMP as well.
4. Implementation of all the NPCs issued for the Project as they relate to construction must also be ensured through CESMP.

Generic mitigation measures based on GIIP to ensure no negative impacts on species of conservation concern that could occur in proposed construction areas, will include but not be limited to:

- Pre-construction surveys to confirm presence/ absence of any species of conservation concern (including checks for ephemeral water bodies suitable for amphibian breeding);
- If present and impacted by works, species encouraged to move or moved to an area unaffected and protected from works (provided legal to do so);
- Clearance of vegetation where species of conservation concern could be present completed under a watching brief by an experienced ecologist;
- Appropriate pollution control measures put in place and/or protection buffers established to ensure no negative impacts on sensitive habitats adjacent to the WPP and species they support.

11.2.2.2 IBA Species

No destruction or disturbance of any IBA qualifying species for the adjacent Deliblato Sands IBA (to include European Bee-eater as listed within the Kraljevac Bog) will take place during the construction phase.

If works cannot take place outside of the breeding periods of IBA species, a pre-works survey to confirm presence / absence of nesting IBA species within or adjacent to construction areas must be completed by an ornithologist. If active nests of IBA species are located in areas potentially impacted by works, nest locations will be protected from disturbance (marked/fenced off with an appropriate buffer) until birds have fledged.

11.2.3 Conclusions

The Primary Mitigation, along with adherence to legal requirements, NPCs and generic GIIP will ensure that all potential negative impacts of the Project on any ecological features are avoided or minimised, and that **no significant negative** residual effects could occur.

Therefore, it can reasonably be expected that construction of the Čibuk 2 WPP Project will result in **no net loss** in any aspect relevant for **any ecological feature.**

11.3 Socio-Economic

11.3.1 Impact Assessment

Socio-economic impacts associated with Project construction activities have been grouped and presented under the following headings:

- Impacts to land use;
- Employment and procurement opportunities;
- Impacts on livelihoods;

- Impacts on infrastructure.

11.3.1.1 Impacts to Land Use

The total area of the Kovin municipality is 370,000 ha and the majority of the land is agricultural (over 60%, approx. 220,000 ha). The total area of the project site is about 4,750 ha and the majority of that land is also arable, agricultural land.

Based upon the current layout and design of Čibuk 2 the amount of land which will be occupied for the Project, during construction and operation is around 8.75 ha of cultivated, agricultural land. Very little additional land may need to be acquired for the widening of access tracks, laying cables and for temporary facilities during construction (laydown areas, construction camp, etc.). The effected area (up to 10 ha) is less than 0.003% of the total area of the municipality, or 0.005% of the total agricultural land in the municipality, or 0.2% of the Project site.

The total land that will be effected during construction is an extremely small portion of (arable) land within the Project site. The sensitivity of individual users of land is low, as the individual effected area of a land plot is also very small and most, if not all, of the land users have other land available for use i.e. the users will not suffer detriment overall. The magnitude of this impact is medium because although it will impact a small number of people, a part of the change will be permanent, and therefore this impact is assessed as **minor adverse**.

Damage to crops in some locations is possible during construction, and if such impacts occur, the Developer will compensate all losses at full replacement cost.

The possibility of impacts on livelihoods is discussed in the section on livelihoods further in the text.

11.3.1.2 Employment and Procurement Opportunities

The size of the construction workforce will not be large due to the technical nature of the Project. It is likely that skilled and semi-skilled labour will be sourced nationally and internationally. Based on experience from the construction of Čibuk 1, up to 30 local individuals may be hired during construction (primarily as unskilled labour). Preference will be given to residents of the effected communities surrounding the Project site, however the availability of working age and unemployed population in these communities is low. The construction phase will last for less than 24 months, and not all workers will be employed for the whole period. The frequency at which workers will be employed and the duration of their engagement will depend on the contractors' organisation of work and could not be precisely estimated at the time of developing this document.

As the total estimated working age population (15 to 64) of the three effected villages is about 8,000 the potential level of employment translates to the creation of jobs for only 0.4% of the local population. The impact at a national level will be negligible. The positive impact will be significant only for those who are employed and their households. Employment opportunities will be short term, during construction, and this too reduces the significance of the impact. Based on experience from other similar projects, in Serbia and elsewhere, the presence of women within the construction workforce will be very small.

On the other hand, the employment of local residents will be beneficial as it should lead to improved relationships between the Project and local communities, improved local skill sets and the reduction of migratory workers moving into the area (although this can have a positive impact on those offering accommodation).

Due to the importance of new employment, particularly for local residents, their sensitivity is considered to be medium. However, due to the short-term nature of employment and the small number of people who will benefit, the magnitude of the impact is considered low. Therefore, the significance of the creation of direct employment opportunities is assessed as **minor beneficial**.

Indirect employment opportunities will be created in connection to the Project's supply chain (goods and services) and spending of Project employees in local communities. The wind turbines will be procured internationally and delivered via the port of Pančevo. Materials needed for civil works and infrastructure improvements such as concrete, sand, gravel, crushed stone, clay, etc., will be procured locally by the selected construction company, as they are available in the area.

Experience from Čibuk 1 other similar projects in Serbia and elsewhere shows that employment of non-locals, as well as the increase of incomes of local employees, will also bring in some benefits for local communities, associated with increased spending in the project area, i.e., in small shops, bars and restaurants, as well as for accommodation. Indirect employment usually provides more opportunities for women in food preparation, cleaning services, accommodation, etc., as opposed to direct employment, which has involved more men.

When taking account that the turbine components will be imported, the overall technical nature of procurement requirements and the short construction timeframe, the magnitude of the impact is considered to be low. However, having in mind the importance of any economic activity in the Project area for the local population, their sensitivity has been rated as medium. The significance of impacts related to indirect employment are therefore assessed as **minor beneficial.**

Appointed construction contractors and suppliers must comply with Serbian Law on Labour and other relevant legislation, which is mostly in agreement with IFC's labour related requirements contained in PR 2. Any additional measures that must be undertaken will be described in the mitigation section.

11.3.1.3 Livelihoods

Land for the Project has been, and will be, acquired through voluntary agreements for all components. The compensation paid is beyond market value (and above full replacement cost). The area of land acquired is also very limited. Therefore, the livelihoods of affected land owners and users will not be negatively impacted.

Increased incomes generated through direct and indirect employment will have a beneficial impact on livelihoods in the local communities. The households whose members may be employed by the Project, as well as those who benefit indirectly from increased spending of these households and non-local employees, will have increased incomes and consequently an improved standard of living, and their sensitivity is considered to be medium. However, due to the low magnitude of the impact because of the small number of employees, particularly local residents and the short-term duration of construction, the significance of these impacts has been assessed as **minor beneficial**.

Transport and increased traffic during construction, especially if mitigated through the development and implementation of a Transport and Traffic Management Plan, are not expected to have any further impacts on livelihoods.

11.3.1.4 Community Infrastructure

The upgrading of existing roads will benefit the local population, including providing improved access to the agricultural land with agricultural machinery. This impact has been recognised as being important for the local population and their sensitivity is therefore considered medium. However, because of the small number of people who will benefit, the magnitude of the impact is considered low and therefore its significance is assessed as **minor beneficial**.

Damage to road surfaces during transport of heavy machinery, leading to damage to motor vehicles and road accidents, are possible. The Developer will maintain the roads used during construction, and the magnitude of the impact is therefore considered to be low. However, the sensitivity of the local population is considered to be medium, due to its dependence on local roads, and the significance of this impact has been assessed as **minor adverse**. In addition, if roads used during construction are not well maintained, this could lead to tensions between the Project and the local communities. Experience from Čibuk 1 suggests that damage to local roads and failure to repair them in a timely manner (particularly following the completion of WPP construction) is among the main sources of dissatisfaction of the local population, which has required communication, involvement of the municipality and implementation of corrective measures.

Utility infrastructure (water, electricity, sewerage) will be secured locally on the Project site and therefore the Project will not impact any community infrastructure during construction.

11.3.2 Impacts Summary

Socioeconomic impacts related to the construction phase are all assessed as having **minor significance**. Negative impacts include those in relation to land use, as about 10 ha of arable land will be occupied during construction, and there may be some damage to crops or road surfaces. All other impacts are positive and they are in relative to the creation of employment and procurement opportunities. This will provide further positive impacts on local livelihoods. The upgrading of access tracks will improve land access for local land owners. The positive impacts are mostly short term and of a local character.

11.3.3 Proposed Mitigation/ Control Measure

11.3.3.1 Land Use

During construction of the WPP there will be a reduction in land available for agriculture. Mitigation measures will be implemented. These measures will include:

- Minimising the amount of land occupied during construction;

- Promptly compensating all damage to land and any other effected assets, i.e., crops;
- Where needed, preserve topsoil and upon the completion of construction activities, fully reinstate all land not permanently occupied.
- Establish and implement a community grievance mechanism.

In total, less than 10 ha of land will remain permanently unavailable for use even after construction. All other land will be available for use in the same way as before the Project.

11.3.3.2 Employment and Procurement Opportunities

Whilst the opportunities for local employment will be very low, the Developer should:

- Announce employment opportunities locally and encourage women to apply;
- Implement transparent and fair recruitment procedures;
- Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations;
- Provide a grievance mechanism for workers;
- Procure goods and services locally whenever possible.

If the above measures are implemented, more local people will be employed and more goods procured locally, enhancing the positive impact.

In addition, all of the above will lead to more local households benefitting and having increased livelihoods and standards of living.

11.3.3.3 Infrastructure

Transport of heavy machinery could lead to damages of road surfaces, further causing accidents, vehicle damages, etc. The following measures will be undertaken to mitigate these impacts:

- Preparation of roads for heavy transport before construction;
- Prompt restoration of roads to at least pre-construction quality;
- Upgrading and regular maintenance of roads will lead to improved access to land and land use for local land owners.

11.3.4 Conclusions

A summary of potential socio-economic impacts during construction is provided in tables below:

Impact or Opportunity:	Reduced amount of land for use by individual users (low sensitive receptors).	**Ref. No.:**	4
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Minimise land that is used/occupied during construction, compensate any damages to land and crops, preserve all topsoil.		
Residual Impact:	In total less than 10 ha of land will remain permanently unavailable for use after construction; however, all other land will be available for use in the same way as before the Project.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 11-1 Reduced Amount of Land for Use

Impact or Opportunity:	Employment opportunities for local residents (medium sensitive receptors).	**Ref. No.:**	5
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Announce employment opportunities locally and encourage women to apply; Implement transparent and fair recruitment procedures; Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations; Provide a grievance mechanism for workers.		
Residual Impact:	More local people are employed than originally anticipated.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 11-2 Employment Opportunities during Construction

Impact or Opportunity:	Procurement opportunities for local companies (medium sensitive receptors).	**Ref. No.:**	5
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Procure goods and services locally whenever possible.		
Residual Impact:	More goods are procured locally than originally anticipated.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 11-3 Procurement Opportunities during Construction

Impact or Opportunity:	Increased livelihoods of local households (medium sensitive receptors).	**Ref. No.:**	6
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ ~~Direct~~/ **Indirect** ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Encourage local employment and procurement to enhance local spending.		

Residual Impact:	More local spending than originally anticipated and better living standard of local households.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 11-4 Increased Livelihoods of Local Households

Impact or Opportunity:	Enhanced land use for local land owners (medium sensitive receptors) as a result of improved access tracks.	**Ref. No.:**	7
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ ~~Direct~~/ **Indirect** ~~Temporary/ Short-term/ Medium-term/ Long-term/~~ **Permanent** **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Regular maintenance of access tracks.		
Residual Impact:	Improved land use for local landowners.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 11-5 Enhanced Land Use

Impact or Opportunity:	Damages to road surfaces on roads used by local residents (medium sensitive receptors).	**Ref. No.:**	8
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Preparations of roads for heavy transport before construction. Prompt restoration of roads to at least pre-construction level. Maintenance of roads during construction.		
Residual Impact:	Although some road damages are to be expected in the short term, regular maintenance will provide improved access to land and land use for local owners and overall good relations with local communities.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 11-6 Damage to Road Surfaces

11.4 Traffic and Transport

Increase of traffic movements in the Study Area has the potential to cause separation from local facilities and services and delay movements between communities. Key potential effects include: severance, driver delay, pedestrian amenity, pedestrian delay and fear and intimidation.

The potential effects on vulnerable road users and traffic safety in local communities have been assessed as part of the community health, safety and security impacts in section 11.12.1.

11.4.1 Impact Assessment

This section describes the trip generation that is expected to arise during the Čibuk 2 WPP construction. This has been estimated by the Developer based on the quantities of material and equipment required for construction of 25 wind turbines and associated infrastructure, as well as previous experience in construction of WPPs in the South Banat.

11.4.1.1 Abnormal Load Transport Route

Each of the 25 WTGs would require 20 abnormal load deliveries which would result in 500 deliveries in total. Once the turbine components are off-loaded, the vehicles can be retracted to make the return journey as regular HGVs.

The projected number of abnormal load vehicles over the 6-month period of transport of turbine components is provided in Table 11-7.

Construction Element		HGVs per Turbine	Number of Turbines	Total number of HGVs
Turbine components	Crane	9	25	225
	Blades	3	25	75
	Nacelle	1	25	25
	Hub	1	25	25
	Tower	5	25	125
	Drivetrain	1	25	25
Total transport for turbine components:		**20**	**25**	**500**

Table 11-7 Projected Abnormal Load Movements

The first part of the route the delivery of large turbine components (Pančevo Port through the urban area of Pančevo) has the highest daily traffic flows (10,000-26,000 vehicles). The Developer is currently (October 2022) considering five options for the route for transport of the large turbine components to the site. Both major roads considered (road No. 10 and No. 14) have moderate daily traffic (between 5,500 and 8,000) with the number of HGVs between 2.4% and 5%.

Delivery of turbine components would be grouped in convoys of up to three vehicles. In accordance with law, turbine deliveries would be undertaken in consultation with Roads of Serbia and local traffic police in order to reduce the effects on road users.

The experience in delivery of turbines for the operational WPPs in South Banat suggests that stopping of traffic for turbine convoys lasted between 30 to 45 minutes two days per week and did not result in significant driver delays including the most trafficked section through the city of Pančevo.

The transport of turbine components is assessed to be a temporary change of a low magnitude and a **minor adverse** significance impact.

11.4.1.2 Major Construction Material Transport Route (Pančevo – Bavanište – WPP Site)

The trip generation is based on projected traffic movements over the construction period of 18 months, assuming 6-day working week. It has been assumed that 30% of the construction traffic would be generated by HGVs and the remaining 70% would arrive on LGVs and cars.

The projected number of HGVs over the 18-month construction period is provided in Table 11-7.

Construction Element		HGVs per Turbine	Number of Turbines	Total number of HGVs
Building materials	Roads	283	25	7,075
	Hardstands and access roads	84	25	2,100
	General clearing works	20	25	500
	Foundation excavation (piles and concrete slab)	60	25	1,500
	Foundations - reinforcement	20	25	500
	Foundations - formwork	5	25	125
	Foundations - concrete (piles and concrete slab)	100	25	2,500
	Support materials	5	25	125
Total transport for building materials:				14,425
Other activities HGVs transport (15%)				2,164
Total:				16,589
Total 2-way movements:				33,178
Working days (6-day week for 18 months):				468
Typical HGVs movements per day:				**71**

Table 11-8 Projected HGVs Movements from the Construction Activities

The estimated number of HGVs movements on an average day during the construction is 71. However, this number would likely increase during the most intensive periods of construction so the number of HGVs movements on a worst-case day may be doubled. For an 18-month construction period, the most intensive months with highest HGV traffic are assumed to be month 6, 7, 8, 9, 10, and 11.

The estimated number of light vehicles (LGVs and personnel private vehicles), based on the 70/30 ratio is 77,415 of total 2-way movements, i.e. 165 light vehicles per day.

The total estimated number of daily vehicle movements on an average day during the 18-month construction period is 236 (165 light vehicles and 71 HGVs).

The Developer intends to commence the construction in Q1 of 2024 meaning that the peak construction period is most likely to occur sometime between June and December 2024.

Given that the site can be accessed by HGVs eastbound from Pančevo, northbound from Kovin, and southbound from Alibunar, all the routes have potential to be used by construction vehicles. However, in order to assess the worst-case scenario, it has been assumed that all construction material for the project would arrive on the shortest route - from Pančevo via Bavanište to the WPP site.

The estimated increase in HGVs traffic flows for road sections along the route from Pančevo via Bavanište to the Čibuk 2 WPP site are provided in Table 11-9.

Road	Section	Length (km)	Baseline HGV	Project HGVs (average)	Total Predicted Daily HGVs	% Increase of HGV
10	Pančevo (Vojvodina border) – Pančevo (Kovin)	4.9	1,062	71	1,133	**7%**
14	Pančevo (Kovin) – Kovin (Bela Crkva)	28.9	387	71	458	**18%**

Table 11-9 Estimated Increase in Daily Traffic Flows between Pančevo and the WPP Site

The results indicate that a traffic flow increase along the route would be negligible, it would experience an increase from 7% to 18% which is below the IEMA threshold of 30% and does not require a detailed assessment of impact significance for this transport link.

Additionally, the road section between Pančevo and Bavanište is not considered to be sensitive to change in traffic flows given that it does not intersect settlements and does not travel near sensitive receptors. Therefore, the IEMA threshold of 10% increase is not applied.

The final stretch of the route towards the site is the 1.5km-long municipal road along the edge of the village of Bavanište. The road is not a primary or essential route used by residents, and the predicted HGV traffic is not considered to cause severance, driver delay, pedestrian delay or affect the pedestrian amenity. The potential adverse effects on this stretch of the road are assessed to be negligible.

The illustration of the estimated increase in daily HGV traffic volume along the major construction transport route Pančevo – Bavanište – WPP site is shown on Figure 11-1.

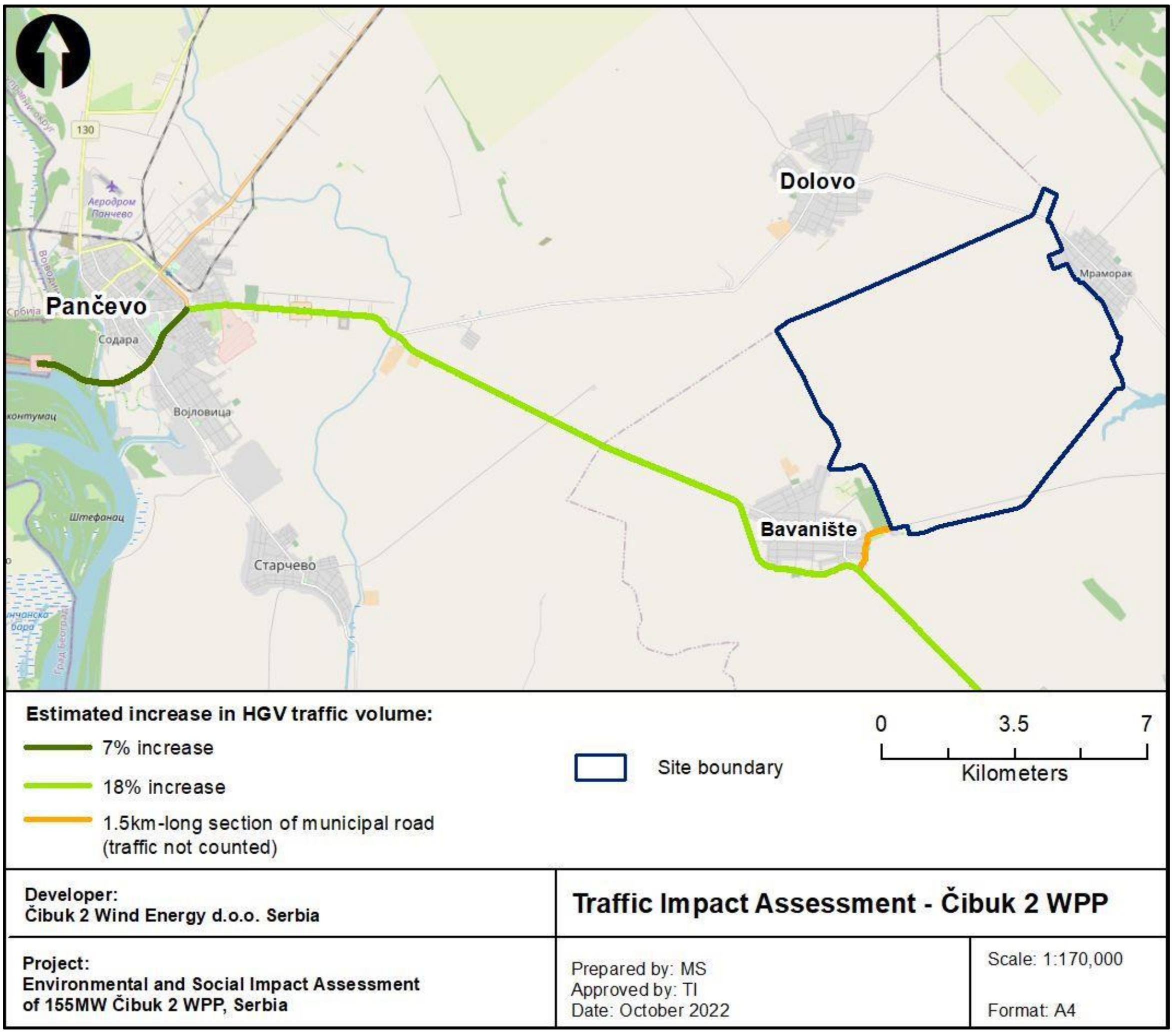


Figure 11-1 Increase in Traffic Volume between Pančevo and the WPP site

11.4.2 Impacts Summary

The transport of other construction material for the proposed Čibuk 2 WPP would contribute to a negligible increase (between 7 and 18%) in HGVs movements along the 25km-long route between Pančevo and the WPP site. The route does not go through settlements. The potential impact on traffic and transportation would be temporary and short-term, with **negligible adverse** significance impact on severance, driver delay, pedestrian delay and amenity.

The transport of turbine components is assessed to be a temporary change of a low magnitude and a **minor adverse** significance impact.

11.4.3 Proposed Mitigation/ Control Measure

A Construction Traffic Management Plan (CTMP) should be developed in consultation with Roads of Serbia, Traffic Police Department in Pančevo and the local municipality of Kovin. The framework for the CMTP should include but not be limited to:

- Agreements with local authorities and stakeholders regarding transport;
- Proposed route for delivery of turbine components;
- Proposed routes for other construction traffic, including methods to reduce the number of trips;
- Arrangements and timing restrictions for construction traffic, especially in the peak construction phase;
- Procedure on advance notification of local communities on turbine component delivery;
- Procedure for transport in adverse weather conditions;
- Route signing and public warning;
- On-site traffic arrangements, monitoring and repair of tracks, parking areas;
- Procedure for regular road cleaning and maintenance including wheel cleaning, road sweeping in the vicinity of the site access point, etc.;
- Feedback mechanism for complaints or inquiries related to construction traffic.

Potential residual impacts would likely be minor driver delays as a result of temporary road closures during the oversized transport of turbine components. Increase of traffic flows of heavy vehicles would add to the risk of road wear and tear. No significant residual impacts are anticipated during the construction transport for the project.

11.4.4 Conclusions

A summary of potential impacts on traffic and transport during the construction activity is provided in Table 11-10.

Impact or Opportunity:	Impact on driver delay during the oversized transport of turbine components. The transport of other construction material would contribute to a negligible increase (between 7 and 18%) in HGVs movements along the 25km-long route between Pančevo and the WPP site.	**Ref. No.:**	
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ **Indirect** **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	A Construction Traffic Management Plan (CTMP) should be developed in consultation with Roads of Serbia, Traffic Police Department in Pančevo and the municipality of Kovin. The CTMP should include procedures related to off-site and on-site transport, suitable transport routes, arrangements with authorities, timing restrictions to mitigate congestion and nuisance, adverse weather conditions, road condition monitoring, etc.		
Residual Impact:	No significant residual impacts are anticipated during the abnormal loads transport for the project. Minor driver delays as a result of temporary road closures. Increase of traffic flows of heavy vehicles would add to the risk of road wear and tear.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** **Minor Adverse** ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 11-10 Transport and Traffic Impact during Construction

11.5 Landscape and Visual

11.5.1 Effects on Landscape Character and Fabric during Construction

The construction phase of Čibuk 2 would last approximately 18 months. The construction works would add temporary built development to an agricultural landscape that is generally tranquil with periodic bursts of farming activity and traffic along the local roads. The construction compound and material storage facilities, movement of large construction machinery across the site, development of access tracks, increase in vehicle traffic, and gradual appearance of new turbines would disturb the static qualities of the landscape character.

Local vegetation and land cover at the site would be subject to direct, localised and temporary disturbance during construction. Excavations for the turbine foundations, underground cabling and other ground disturbance works would temporarily affect several hectares of farmland at the site. Compared to the vast majority of the Čibuk 2 site (ca. 4,750 hectares), a very small proportion of the overall site area would be effected. Upon the site reinstatement after construction, the lost vegetation would not affect any landscape feature of particular value to the wider landscape.

The large scale and flat topography with very few natural features make the landscape in the Study Area low sensitive to the construction activities. While the works would be a change of high magnitude within the local area of approx. 2km of each turbine, they would be temporary and short-term. In the context of the area as a whole, the works would have a medium to low magnitude effect. The impact of the construction activity is considered to be of **moderate to minor adverse** significance.

11.5.2 Visual Effects during Construction

Visual effects during construction would occur in two stages. The early stage would include preliminary construction works at ground level (excavation of turbine foundations, underground cabling, development of access tracks, etc.) which would have intermittent visibility from parts of the surrounding area, mostly from the nearby municipal roads Dolovo – Mramorak and Deliblato – Mramorak. This would be a short-term medium magnitude change on local residents and visitors (highly sensitive) and road users and workers (medium sensitive) and would result in **moderate adverse** significance impact for local residents and visitors and **minor adverse** significance for road users and workers in the open areas.

The later stage would include the erection of the proposed wind turbines which would involve large cranes and would be visible to a wider range of receptors, including local residents in Mramorak, Dolovo, Bavanište and Deliblato settlements (receptors of high sensitivity).

The duration of the construction phase effects would be short-term and localised resulting in a medium to low magnitude of change that would give rise to **moderate adverse** effect for local residents and visitors and **minor adverse** effect for road users, people involved in recreational activity, and workers in the open areas.

11.5.3 Impacts Summary

The construction works would be direct, negative, temporary and short-term and would primarily affect the landscape and visual receptors within the local area.

The effects on the landscape character would be moderate (within 2km of each turbine) to minor (as the distance from the site increases).

The visual effects during construction would be moderate for local residents in the close site vicinity and minor for all other residents and local road users, people involved in recreational activity, and people working in the open area.

11.5.4 Proposed Mitigation/ Control Measure

Landscape and visual mitigation measures proposed for the project are part of standard construction practices that should be part of the agreed construction method statement. The mitigation should include but not be limited to:

- All ground disturbances should be confined (where possible) to the construction compound, access tracks, turbine base areas, substation compound, routes for underground cables and OHL pylons.
- Existing vegetation should be suitable protected; land clearance/vegetation removal should be minimised as far as possible;
- Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required;

- Stockpiling of excavated material or construction debris should be avoided; the construction site should be maintained in good condition;
- The areas disturbed during the construction should be successively restored and reinstated.

Provided that the mitigation measures are implemented, the residual impact on the landscape character would be **minor adverse**.

No specific measures are proposed to mitigate the visual effects of the construction works. The residual impact would be **moderate adverse** for local residents and visitors and **minor adverse** for local road travellers, people involved in recreational activity, and people who work in the open area.

11.5.5 Conclusions

A summary of potential landscape and visual impacts during the construction activity is provided in Table 11-11 and Table 11-12.

Impact or Opportunity:	Impact on the low sensitive landscape character and fabric during construction.	**Ref. No.:**	
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	All ground disturbances should be confined (where possible) to the construction compound, access tracks, turbine base areas, substation compound, routes for underground cables and OHL pylons. Existing vegetation should be suitable protected; land clearance/vegetation removal should be minimised as far as possible; Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required; Stockpiling of excavated material or construction debris should be avoided; the construction site should be maintained in good condition; The areas disturbed during the construction should be successively restored and reinstated.		
Residual Impact:	A minor portion of the landscape character and fabric would be temporarily affected.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	~~Negligible Adverse~~ **Minor Adverse** ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 11-11 Impact on Landscape Character and Fabric during Construction

Impact or Opportunity:	Visual impact on local residents, visitors, road users, people involved in recreational activity, people working in the area during construction, including highly sensitive residential receptors in the vicinity of the site (to the south-west, east, and north-west).	**Ref. No.:**	
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	No specific mitigation measures are proposed. Mitigation of the impact on the landscape character would mitigate the visual impact as well.		
Residual Impact:	Short-term and localised impact, affecting mostly the residents immediately south-west, east, and north-west of the site and would decrease with the distance.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~	~~No Change~~	~~Negligible Adverse~~ **Minor Adverse**

	~~Minor Beneficial~~ ~~Negligible Beneficial~~		**Moderate Adverse** ~~Significant Adverse~~

Table 11-12 Visual Impact during Construction

11.6 Construction Noise

Construction noise effects are normally of a temporary nature and result from both moving and static sources. Assessment allows the temporary impact of construction noise to be understood and for suitable mitigation measures to be identified to minimise any potential adverse effects.

11.6.1 Impact Assessment

Construction Noise

Noise during the construction period will arise from the excavation of the turbine foundations, trenches, maintenance pads, and the substation, as well as from large concrete pours and from the erection of the turbines. These activities are localised, short term and large source to receiver distances will ensure noise levels are low. The equipment used is not expected to generate more than negligible levels of noise.

Excavation and earth moving machinery will be used during the preparation of WTG foundations. The preparation of steel formwork will only generate negligible levels of noise. Pouring concrete to form the foundations of each WTG will require a large number of delivery vehicles and the use of a concrete pump. Forming the foundation is likely to take in excess of 12 hours as this must be done in a single, continuous pour. In some cases, the pour may extend in to the evening. Whilst the movement of the concrete delivery vehicles will effect a larger number of people (see the transportation section below) the noise associated with the construction of each foundation will be localised.

The movement of the cranes used to erect the WTGs may be heard by local people but the impact will be very short term. The operation of the cranes generates only negligible levels of noise.

Standalone diesel generators will be used at each construction area. Electrical power is required to commission each WTG and some lighting may be used.

Noise during construction will have a **negligible effect**. Noise from construction equipment is limited by the Serbian legislation and a CESMP will be prepared to set out the measures use to control construction noise.

Transportation Noise

Traffic noise will occur from vehicles on local roads associated with the delivery of the turbine components, concrete and other construction materials. Most of these activities will occur within the site and far from residential properties. This can be assessed in relation to existing traffic flows. Information on traffic flows has been taken from Transport assessment and noise effects due to the increase in traffic flows calculated.

The total estimated number of daily vehicle movements on an average day during the 18-month construction period is 236 (165 light vehicle and 71 HGVs). To assess the increase in noise these values have used in the calculations set out in Table 11-13, below.

Table 11-13 Predicted Increase in Noise due to Construction Traffic

Road	Base Year 2021		Construction Traffic		Totals		Traffic Speed (km/h)	Increase in Noise (dB)		
	Total Vehicles	HGVs	Total Vehicles	HGVs	Total Vehicles	HGVs		Vehicles (Flow)	% HGVs	Total Increase
Pančevo (Vojvodina border) – Pančevo (Kovin)	25,577	1,062	236	71	25,742	1,133	70	0.0	0.1	0.1
Pančevo (Kovin) – Kovin (Bela Crkva)	7,999	387	236	71	8164	458	70	0.1	0.2	0.3

The calculations show that any increase in noise due to the transportation effects will be between no greater than 0.3 dB. This is negligible. The calculations above are for the average traffic movements. At peak times a greater impact will occur although this would still be **negligible**.

11.6.2 Impacts Summary

Construction noise levels are expected to have a **negligible** effect as the construction work is short-term in nature and will take place some distance from any sensitive receptors. The increase in noise due to construction traffic is also rated as negligible.

11.6.3 Proposed Mitigation/ Control Measure

Noise emissions from construction equipment will be limited by the Serbian legislation and a CESMP will be prepared to ensure that construction noise is controlled. This will include the adoption of best practical means measures to reduce noise. Vibration from construction can occur but this again tends to dissipate with distance and no significant effects are likely.

There will be no residual impact for short-term noise.

11.6.4 Conclusions

A summary of potential noise and vibration impacts during the construction activity is provided Table 11-14,

Impact or Opportunity:	Construction Noise		**Ref. No.:**	16, 17
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary/~~ **Short-term**/ ~~Medium-term/ Long-term/ Permanent~~ Local/ National/ Regional			
Impact Mitigation or Opportunity Enhancement:	Noise from construction equipment is limited by Serbian law. A CESMP will be prepared which will detail mitigation methods in accordance with the principle of using best practicable means to reduce noise. The increase in HGVs will have a negligible impact on traffic noise levels.			
Residual Impact:	No significant impact for short-term noise.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** **(Construction Noise on Site including Construction Traffic)** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 11-14 Construction Noise Impacts - Summary

11.7 Archaeology and Cultural Heritage

11.7.1 Impact Assessment

The statutory stakeholder, Institute for Cultural Heritage in Pančevo, identified three preliminary designated cultural heritage areas at the site, suspected to contain artefacts from the Late Antique and Medieval periods (discussed in Section 8.10 Archaeology and Cultural Heritage). The areas have been designated as the 1st degree protection zones with respect to the Čibuk 2 development.

The construction works could potentially destroy archaeological artefacts which would have a moderately adverse impact significance. The Institute for Cultural Heritage required a mandatory pre-construction rescue excavation in the areas of the proposed WTGs No. 1, 8, 12, 18, 33.

Additional four areas within the site have been identified as the 2nd degree protection zones which require permanent archaeological supervision during the excavation works on the turbines foundations and associated underground cabling. These areas include the proposed WTGs No. 7, 11, 16, 19, 22, 23, 25, 27, 28, 31. In case of valuable findings, the Developer is obligated to finance the archaeological rescue excavation.

The remaining site area has been identified as the 3rd degree protection zone where general precautionary measures must be implemented.

11.7.2 Impacts Summary

If unmitigated, the construction works have the potential to destroy archaeological artefacts from the Late Antique and Medieval periods suspected to be present at the site.

11.7.3 Proposed Mitigation/ Control Measure

A set of measures should be implemented during the pre-construction and construction works, as required by the competent authority:

- The Developer must finance a pre-construction rescue excavation in the areas of the proposed WTGs No. 1, 8, 12, 18, 33. The financing must be provided at least 12 and not later than 6 months before the commencement of the earthworks;
- The Developer should promptly inform the competent authority (Institute for Cultural Heritage in Pančevo) about the commencement of earthworks;
- During the construction, archaeological supervision of works will be mandatory in the areas of foundations of the WTGs 7, 11, 16, 19, 22, 23, 25, 27, 28, 31. In case of valuable findings, the archaeological rescue excavation will be conducted;
- A chance finds procedure should be developed and workers trained to implement it. In case of chance finds, all work should be immediately halted and the area protected until the Institute for Cultural Heritage in Pančevo secures the findings.

In case that the measures are implemented, there should be no impact on cultural heritage and archaeological findings.

11.7.4 Conclusions

A summary of potential impacts on archaeology and cultural heritage during the construction activity is provided in Table 11-15.

<table>
<tr><td>Impact or Opportunity:</td><td colspan="2">Damage of archaeological artefacts or features by the construction works.</td><td>Ref. No.:</td><td></td></tr>
<tr><td>Characteristics of the Impact or Opportunity:</td><td colspan="4">~~Positive~~/ Negative
Direct/ ~~Indirect~~
~~Temporary/ Short-term/ Medium-term/ Long-term~~/ Permanent
Local/ ~~National~~/ ~~Regional~~</td></tr>
<tr><td>Impact Mitigation or Opportunity Enhancement:</td><td colspan="4">The Developer must finance a pre-construction rescue excavation in the areas of the proposed WTGs No. 1, 8, 12, 18, 33. The financing must be provided at least 12 and not later than 6 months before the commencement of the earthworks;
The Developer should promptly inform the competent authority (Institute for Cultural Heritage in Pančevo) about the commencement of earthworks;
During the construction, archaeological supervision of works will be mandatory in the areas of foundations of the WTGs 7, 11, 16, 19, 22, 23, 25, 27, 28, 31. In case of valuable findings, the archaeological rescue excavation will be conducted;
A chance finds procedure should be developed and workers trained to implement it. In case of chance finds, all work should be immediately halted and the area protected until the Institute for Cultural Heritage in Pančevo secures the findings.</td></tr>
<tr><td>Residual Impact:</td><td colspan="4">If suspected archaeological artefacts or chance finds are encountered - potential for slowing down construction. Any findings will increase knowledge of archaeological and cultural heritage.</td></tr>
<tr><td>Residual Impact Rating:</td><td>~~Substantial Beneficial~~
~~Moderate Beneficial~~
Minor Beneficial
~~Negligible Beneficial~~</td><td>~~No Change~~</td><td colspan="2">~~Negligible Adverse~~
~~Minor Adverse~~
~~Moderate Adverse~~
~~Significant Adverse~~</td></tr>
</table>

Table 11-15 Cultural Heritage and Archaeology Impact during Construction

11.8 Land and Groundwater Quality

Construction activities would have the potential to effect the soil and groundwater by (1) long-term loss of agricultural soil in the areas of WTGs, crane pads and access tracks, (2) degradation of soil resulting from top soil removal and compaction, (3) change of groundwater regime due to potential dewatering during construction of turbine foundations and piling, and (4) local soil and groundwater contamination in case of accidental release of fuels, oils, chemicals, uncontrolled release of concrete batching wastewater or uncontrolled discharge of sanitary wastewater.

11.8.1 Soil Impact Assessment

The soil at the site is used for agricultural production and its sensitivity is considered to be medium as it has been subject to degradation by agricultural practices. The construction of turbine foundations, crane pads and access roads would lead to a loss of about 0.2% of agricultural land available at the site which would be a change of negligible magnitude and would result in a **negligible adverse** significance impact.

During the works, moving of heavy machinery over unmade areas might compact the soil and change its structure. The compaction decreases the soil porosity and restricts infiltration of water which leads to drainage issues (formation of ponds) and the loss of valuable nutrients. The effect would be localised to areas of construction activities and would present an effect of a medium magnitude and **moderate significance** that requires control measures.

Accidental release of fuels, oils, or chemicals to the ground has the potential to occur in the construction lay-down area, during delivery, storage, handling and use of hazardous materials. Volumes of fuel and chemicals stored at the site would be limited. The effect on soil quality (low sensitive receptor) would be long-term but localised, affecting the area of the release and as such is considered to be of a low magnitude. The impact significance is assessed as **minor adverse**.

11.8.2 Groundwater Impact Assessment

There is the potential to affect the shallow groundwater aquifer during the excavations for turbine foundations and drilling of piles. The excavations for turbine foundations would be shallow (up to 5-6m deep). Each turbine foundation would be supported by 40-45 concrete piles (1m diameter each), that would be drilled to a depth of up to 20-30m b.g.l.

The need for short-term dewatering during the excavation works cannot be ruled out and can temporarily affect the groundwater regime of the shallow aquifer. The geotechnical drilling at the site determined the groundwater level in shallow aquifer to be in the range from 6.6 to 10.6m b.g.l.

The groundwater sensitivity of the shallow aquifer is assessed to be low. The aquifer has a low yield and is polluted by agricultural activity and not used for drinking water supply. The radial extent of the groundwater cone of depression that would be formed as a result of dewatering would depend on the pumping rate, duration of dewatering and the hydraulic conductivity of the shallow aquifer. Taking into account the hydrogeological conditions at the site, it is estimated that the radius of the groundwater cone would be about dozens of metres and that a few days would be needed for the groundwater level to recharge to its initial level. The presence of privately used dug or drilled wells within the dewatering radius of influence is unlikely due to the distance involved - the nearest residential houses are located more than 2km from the nearest proposed WTGs.

The major sub-artesian aquifer is at a depth of more than 70m b.g.l. Given the depth and the fact that it is a hydraulicly separate system, i.e. a pressurized confined aquifer recharged far from the development site, it is not likely that it would be affected by the potential dewatering works.

The potential lowering of groundwater table within the shallow aquifer would be a temporary and short-term indirect result of the dewatering and would present a change of low magnitude and **minor adverse** significance effect.

The potential of contaminants to migrate to groundwater depends on the aquifer sensitivity and type and volume of the released contaminant. The shallow low-yield aquifer in the area is formed within a low-permeable alluvial marshy deposits. The shallow aquifer is considered to be low sensitive to contaminant migration given the low hydraulic conductivity of subsurface loess layer and significant presence of clayey component in the marshy sediments which serves as a protective layer. The potential accidental release of hazardous materials would result in a low magnitude change to the groundwater and **minor adverse** significance effect.

11.8.3 Impacts Summary

The construction activity has the potential to affect the local land and groundwater. Loss, compaction and degradation of soil would be a moderate significant impact. Potential releases of hazardous materials to the ground would be a moderate adverse effect for soil and minor adverse effect for groundwater. Lowering of groundwater regime would be a minor adverse significant effect.

Measures should be employed to reduce the risk for soil and groundwater posed by the construction activities.

11.8.4 Proposed Mitigation/ Control Measure

11.8.4.1 Loss, Compaction or Degradation of Soil

- Removed topsoil should be stored adjacent to the excavated area and later used to cover backfilled areas;
- Topsoil removal and stockpiling should be halted if topsoil is saturated with water; soil compaction and long-term damage to soil structure will be avoided by handling soils that are in a suitably dry condition and not during wet weather;
- Removed topsoil should be preserved for re-use;
- Topsoil stockpiles should have adequate height and slope gradient and their erosion should be prevented by controlled compacting to the level that presents no threat of development of anaerobic processes;
- Excavations and areas of exposed soils should be reinstated as soon as practicable once construction works are complete at a certain location.

Provided that the control measures are implemented, the residual impact on soil would be **negligible adverse**.

11.8.4.2 Change to Local Groundwater Regime in case of Dewatering

No specific mitigation measures are proposed as the potential impact would be temporary. The residual impact would be **no change**.

11.8.4.3 Contamination of Soil and Groundwater

- Storage of fuels, oils, chemicals, and liquid waste materials should be carried out in designated, dedicated areas, equipped with spillage protection;
- Fuelling and maintenance of machinery and vehicles should be carried out in a designated area with available spill kits and drip trays;
- Appropriate working procedures should be implemented to minimise the risk of accidental release during storage and handling of hazardous materials, washing down of plant and equipment and fuelling and maintenance of machinery and vehicles;
- Emergency response plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc;
- Water generated by dewatering should be pre-treated by silt busters or sediment tanks prior to discharge to natural recipients (nearby water canals or adjacent land).

Provided that the control measures are implemented, there should be no contamination of land and groundwater at the site (**no change**).

11.8.5 Conclusions

The summary of potential land and groundwater impacts is provided in tables below:

Impact or Opportunity:	Loss, compaction or degradation of agricultural soil (medium-sensitive receptor) during construction.	**Ref. No.:**	
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		

Impact Mitigation or Opportunity Enhancement:	Removed topsoil should be stored adjacent to the excavated area and later used to cover backfilled areas; Topsoil removal and stockpiling should be halted if topsoil is saturated with water; soil compaction and long-term damage to soil structure will be avoided by handling soils that are in a suitably dry condition and not during wet weather; Removed topsoil should be preserved for re-use; Topsoil stockpiles should have adequate height and slope gradient and their erosion should be prevented by controlled compacting to the level that presents no threat of development of anaerobic processes; Excavations and areas of exposed soils should be reinstated as soon as practicable once construction works are complete at a certain area.		
Residual Impact:	Loss, compaction or degradation of agricultural soil within the project footprint.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 11-16 Soil Degradation Impact during Construction

Impact or Opportunity:	Impact on local groundwater regime (low sensitive receptor) in case of dewatering.		**Ref. No.:**	
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** ~~Direct~~/ **Indirect** **Temporary**/ **Short-term**~~/ Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ National/ Regional			
Impact Mitigation or Opportunity Enhancement:	No specific mitigation measures.			
Residual Impact:	Temporarily lowered groundwater level in the shallow aquifer in the site area.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	~~Negligible Adverse~~ **Minor Adverse** ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 11-17 Impact on Local Groundwater Regime during Construction

Impact or Opportunity:	Contamination of soil (medium-sensitive) and groundwater (low-sensitive receptor) due to accidental release of hazardous materials or waste.	**Ref. No.:**	
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Storage of fuels, oils, chemicals, and liquid waste materials should be carried out in designated, dedicated areas, equipped with spillage protection; Fuelling and maintenance of machinery and vehicles should be carried out in a designated area with available spill kits and drip trays; Appropriate working procedures should be implemented to minimise the risk of accidental release during storage and handling of hazardous materials, washing down of plant and equipment and fuelling and maintenance of machinery and vehicles; Emergency response plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc.		

	Water generated by dewatering should be pre-treated in silt busters or sediment tanks prior to discharge to natural recipients (nearby water canals or adjacent land).		
Residual Impact:	There should be no residual impact of soil and groundwater contamination.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 11-18 Soil and Groundwater Contamination Impact during Construction

11.9 Surface Water and Wastewater

The development site is intersected by natural and man-made drainage canals. The proposed WTGs are located more than 100m from the canals.

According to the information provided by the public water management company “Vode Vojvodine” (VV) as part of the Location conditions for the WPP, the proposed underground electric and optic cabling route crosses the drainage canals at 6 locations (Figure 11-2).

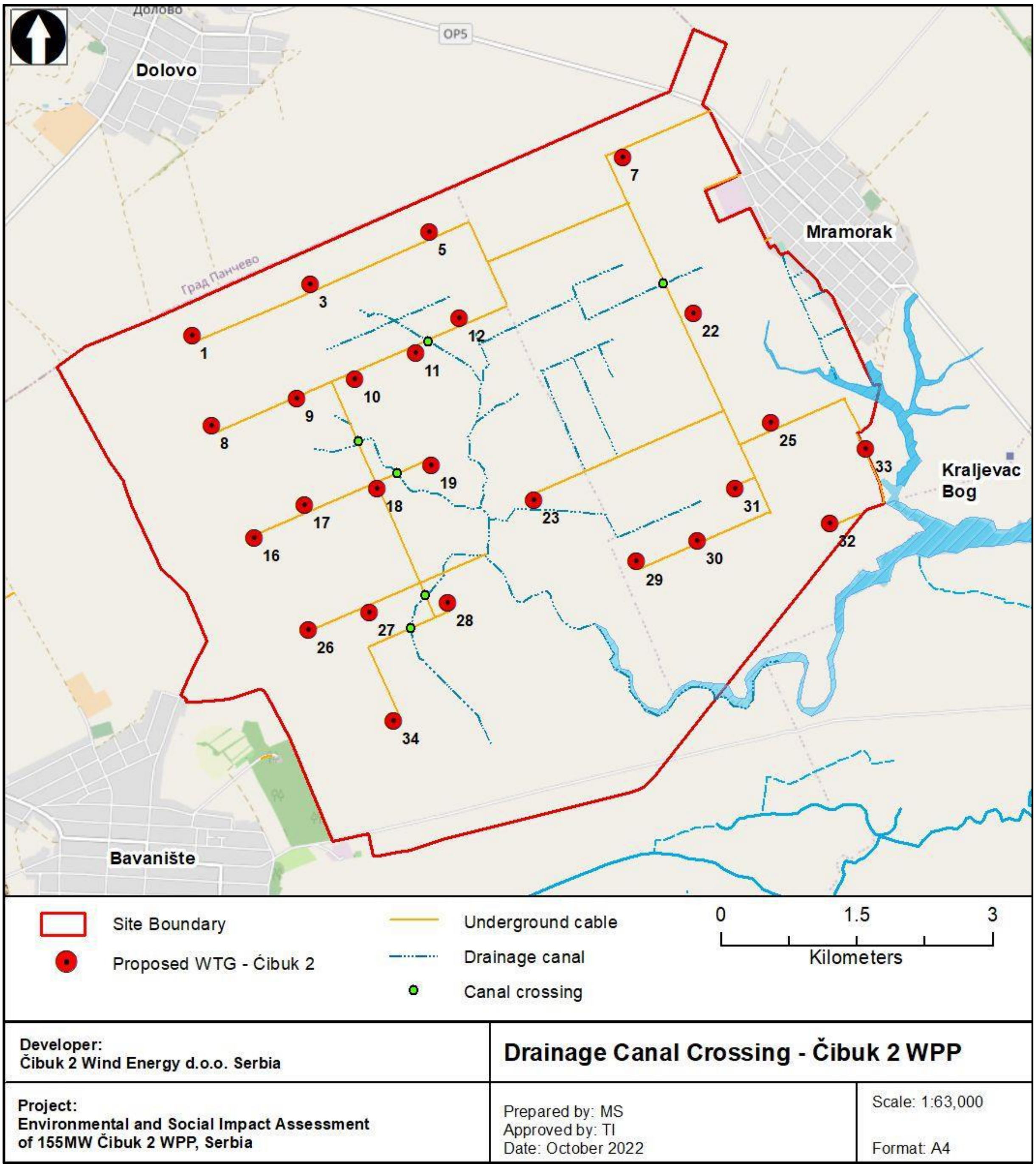


Figure 11-2 Crossing of Drainage Canals by Underground Cables

As part of the Location conditions, the competent authority - Provincial Secretariat for Agriculture, Water Management and Forestry (PSAWMF) provided detailed technical requirements related to the installation of cables, including the mandatory setback distance of 5m from the canal, cable laying at least 1m below the canal bed, protection of cables to avoid any damage by the canal maintenance mechanisation, etc. In case of disturbance or damage of a drainage canal during the construction, the Developer must restore it to its prior condition.

The 'Design for Building Permit' of the WPP must be developed in accordance with the PSAWMF requirements and is subject to approval by VV and the PSAWMF.

The construction activities would have the potential to affect the drainage canals by:

- Pollution from sediment transport and run-off;
- pollution from contaminated surface run-off;

- disturbance of banks of local drainage canals, and
- pollution from direct discharge of domestic wastewater.

11.9.1 Impact Assessment

As noted in section 7.1.5 Surface Water and Drainage, the sensitivity of the canals with respect to their drainage properties is considered to be medium. With respect to water quality, the canal sensitivity is low.

During and after rainfall events, the construction activity may generate sediment transport and silty surface runoff from dewatering of excavations, exposed ground, earth stockpiles, vehicle/plant washing areas, or washing down concrete mixing equipment. If uncontrolled, the sediment transport and surface run-off would affect the drainage function of the canals (medium sensitive) which would be an effect of a medium magnitude prior to mitigation. The initial impact would be **moderate adverse** and would require appropriate control measures.

Oil and fuel may leak or spill and contaminate the surface run-off and the canals. The cement component in wastewater is highly alkaline and any spillage from cement-related work would impair the quality of local streams (low sensitive). The scale of change would be medium, resulting in **minor adverse** impact significance, prior to mitigation.

Construction works close to the canals can affect the integrity of banks through direct damage of bankside material or indirectly, through soil loosening which can alter the stream morphology, initiate erosion or even destroy the banking. This would be a high magnitude impact on a medium sensitive receptor which would result in **major adverse** impact significance.

Sanitary wastewater from workers domestic facilities has a high organic load and can pollute the canals if directly discharged. The magnitude of change prior to mitigation would be medium, on a low sensitive receptor, resulting in the initial impact of **minor adverse** significance.

11.9.2 Impacts Summary

The construction works would generate the sediment transport, potentially contaminated surface runoff, cement-based products and sanitary wastewater that would all constitute the effects of **moderate to minor adverse** significance prior to mitigation. Works close to the canals can affect the integrity of the banks which would result in **major adverse** impact if not controlled.

11.9.3 Proposed Mitigation/ Control Measure

11.9.3.1 Uncontrolled discharge of silty or contaminated runoff during construction

- Procedure for works during wet periods should be developed and implemented. Certain activities (e.g. trenching, excavation) might need to be ceased during periods of intense rainfall;
- Silty and potentially contaminated runoff from the construction site should be contained to allow settlement and cleaning prior to its release. A drainage system should be designed including appropriate treatment facilities such as settlement ponds, silt fences, and oil interceptors where necessary;
- Excavations' face should be kept minimal to avoid the exposure of exposed surfaces to natural conditions.
- In the areas where hazardous materials and waste will be stored, secondary containment should be provided to retain any leakage; Spillage kits should be provided at key locations on site and in particular at refuelling areas, and staff should be trained to use them.

11.9.3.2 Uncontrolled release of cement-based products during construction

- If concrete batching is undertaken at the site, a designated area should be provided at a safe distance from the canals.
- No discharge of cement-contaminated water to the construction drainage system or to any canal must be allowed;
- Concrete batching wastewater should be treated in sedimentation ponds and reused where possible;
- Concrete washout should be conducted in designated areas, lined to prevent infiltration to the subsurface and covered to prevent the collection of rainfall;

- Solidified content cleaned down from lorry chute should be cleared from the site and disposed of with other construction waste.

11.9.3.3 Disturbance of Canal Banks

- During the installation of underground cables beneath the drainage canals, the cable pipeline should be buried at least 1m below the canal bed;
- Wherever possible, a minimum 15 metre buffer zone should be maintained between the works area and a canal. No storage of material or parking of machinery must be allowed in the buffer zone;
- In case of any disturbance or damage of a canal, the natural width, depth and bed material must be restored and the banks re-established with native riparian vegetation.

11.9.3.4 Uncontrolled discharge of sanitary wastewater from workers domestic facilities

- Sanitary facilities should be regularly inspected and wastewater disposed of by a licensed contractor;
- Sanitary wastewater should not be discharged to the drainage canals.

Provided the proposed measures are implemented there should be **no residual impact** on the canals at the site.

11.9.4 Conclusions

A summary of effects related to wastewater impacts during the construction of the proposed Čibuk 2 WPP is provided in tables below.

Impact or Opportunity:	Uncontrolled discharge of silty or contaminated runoff to the drainage canals (medium sensitive) during construction.		**Ref. No.:**	
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Procedure for works during wet periods should be developed and implemented. Certain activities (e.g. trenching, excavation) might need to be ceased during periods of intense rainfall; Silty and potentially contaminated runoff from the construction site should be contained to allow settlement and cleaning prior to its release. A drainage system should be designed including appropriate treatment facilities such as settlement ponds, silt fences, and oil interceptors where necessary; Excavations' face should be kept minimal to avoid the exposure of exposed surfaces to natural conditions. In the areas where hazardous materials and waste will be stored, secondary containment should be provided to retain any leakage; Spillage kits should be provided at key locations on site and in particular at refuelling areas, and staff should be trained to use them.			
Residual Impact:	There should be no residual impact of sediment transport and surface runoff at the site.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 11-19 Impact of Silty and Contaminated Runoff during Construction

Impact or Opportunity:	Uncontrolled release of cement-based products to the drainage canals (low sensitive) during construction.	**Ref. No.:**	
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		

Impact Mitigation or Opportunity Enhancement:	If concrete batching is undertaken at the site, a designated area should be provided at a safe distance from canals. No discharge of cement-contaminated water to the construction drainage system or to any canal must be allowed; Concrete batching wastewater should be treated in sedimentation ponds and reused where possible; Concrete washout should be conducted in designated areas, lined to prevent infiltration to the subsurface and covered to prevent the collection of rainfall; Solidified content cleaned down from lorry chute should be cleared from the site and disposed of with other construction waste.		
Residual Impact:	There should be no residual impact of concrete wastewater on local drainage canals.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 11-20 Impact of Concrete Batching Wastewater during Construction

Impact or Opportunity:	Disturbance of canal banks (medium sensitive receptor) during construction.	**Ref. No.:**	
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **~~Long-term~~**/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	During the installation of underground cables beneath the drainage canals, the cable pipeline should be buried at least 1m below the canal bed; Wherever possible, a minimum 15 metre buffer zone should be maintained between the works area and a canal. No storage of material or parking of machinery must be allowed in the buffer zone; In case of any disturbance or damage of a canal, the natural width, depth and bed material must be restored and the banks re-established with native riparian vegetation.		
Residual Impact:	There should be no disturbance of canal banks.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 11-21 Disturbance of Canal Banks during Construction

Impact or Opportunity:	Uncontrolled discharge of sanitary wastewater from workers domestic facilities to drainage canals (low sensitive receptor).	**Ref. No.:**	
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Sanitary facilities should be regularly inspected and wastewater disposed of by a licensed contractor; Sanitary wastewater should not be discharged to the drainage canals.		
Residual Impact:	There should be no impact of sanitary wastewater to the drainage canals.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~

	~~Minor Beneficial~~ ~~Negligible Beneficial~~		~~Moderate Adverse~~ ~~Significant Adverse~~

Table 11-22 Sanitary Wastewater Impact during Construction

11.10 Environmental Pollution

Other potential sources of environmental pollution at the development site would be air emissions during the excavation works and movement of mechanisation and vehicles.

11.10.1 Impact Assessment

11.10.1.1 Air Emission

Construction activities with potential to directly affect the ambient air quality by generating fugitive dust, fine particulate matter ($PM_{2.5}$, PM_{10}) and exhaust emissions (NO_2) from machinery are the following: (1) earth works (including land clearing, excavation, levelling, stockpiling, backfilling), (2) construction plant and delivery of aggregate and concrete (premix), (3) movement of construction mechanisation and transport vehicles. Uncontrolled air emissions would present a source of pollution during the construction activities.

Deposition of dust cause a nuisance and affect vegetation and crops. Favourable conditions for dust generation are extended dry weather combined with high winds. The possible impacts may be expected near to dust sources, at a distance of up to 500 metres.

The closest residential houses are situated more than 1,100m from the outmost WTGs No. 7 and 22. Given the distance involved, potential dust deposition would have temporary and short-term low to negligible effect on the residential houses and **minor to negligible adverse** significance.

The exhaust emissions from construction vehicles and transport equipment would contribute to the existing traffic emissions at the local roads. The volume of local road transport in the area is low, and is not considered a significant source of air pollution. No long-term idling is anticipated along the transport route in the vicinity of residential receptors. Given the short-term nature of the construction period, and the limited area to be developed within the context of the large-scale nature of the site, effects on local air quality are likely to be **negligible adverse**.

11.10.2 Impacts Summary

Deposition of dust would have the potential to temporarily increase dust emission. The closest residential properties are situated more than 1km from the proposed turbines. Given the distance involved, prior to mitigation the impact would be **minor to negligible adverse** for the closest properties. The effect of the exhaust emissions from construction vehicles is considered to be negligible adverse given the short-term nature of the works, and a large-scale nature of the site.

11.10.3 Proposed Mitigation/ Control Measure

11.10.3.1 Air Emission

The measures to control dust and exhaust emissions are part of good construction practice commonly used at construction sites. A range of measures that should be implemented include: dust suppression (watering and sprinkling), covering of transport vehicles carrying the dusty material, topsoil stripping close to the period of excavation, barriers where needed to protect receptors from dust, speed limits on transport roads including dirt tracks, regular maintenance of machinery and vehicles, etc.

With the control measures employed, any emissions would be of a temporary nature minimising any potential for a nuisance to occur. The residual impact would be **negligible adverse**.

11.10.4 Conclusions

A summary of effects related to air emission impacts and contaminated land during the construction of the proposed Čibuk 2 WPP is provided in the table below:

Impact or Opportunity:	Dust emission during construction works and exhaust emissions from machinery and vehicles to residential houses in nearby villages (highly sensitive receptors).	**Ref. No.:**	

Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Dust suppression techniques (watering and sprinkling) should be applied; • Transport vehicles carrying the dusty material should be covered; • Topsoil stripping should be undertaken close to the period of excavation; • Barriers should be erected where needed to protect receptors from dust; • Speed limits should apply on transport roads including dirt tracks. Regular maintenance of machinery and vehicles should be provided.		
Residual Impact:	Dust propagation should be limited to construction area and should not influence the local communities.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 11-23 Air Emission Impact during Construction

11.11 Ecosystem Services

The Čibuk 2 development site is a source of provisioning ecosystem services (crop cultivation).

11.11.1 Impact Assessment

Crops cultivated at the Project site are main source of income to local farmers and a benefit to their livelihoods. The majority of farmers do not have a viable income alternative to crop production. Crop cultivation is therefore considered to be a priority ecosystem service, i.e. high sensitive receptor.

The construction works would temporarily disrupt crop production at the development site. The area that would be disrupted for an 18-month construction period is estimated to ca. 10ha which accounts for around 0.2% of the total site area, i.e. a small portion of the site. Apart from the short-term disruption, the Project would not alter this ecosystem service. The magnitude of change is considered to be low, resulting in the overall **minor significance** of the impact.

11.11.2 Impacts Summary

The construction activity would result in a short-term disruption of a priority ecosystem service – crop production which is considered to be an impact of **minor adverse** significance.

11.11.3 Proposed Mitigation/ Control Measure

Mitigation measures for disruption of crop production greatly overlap with the measures applicable to loss of livelihoods as a result of land acquisition (Section 0 Socio-Economic Impacts during Construction).

Provided that the measures to mitigate the loss of livelihoods are implemented, the residual impact on ecosystem services would be reduced to **negligible adverse**.

11.11.4 Conclusions

A summary of effects related to the impact on ecosystem service during the construction of the proposed WPP is provided in tables below.

Impact or Opportunity:	Disruption to crop cultivation as a priority ecosystem service (a highly sensitive receptor) during the construction activity.	**Ref. No.:**	
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		

Impact Mitigation or Opportunity Enhancement:	Measures to mitigate the loss of livelihoods as a result of land acquisition are applicable to disruption of the ecosystem service.		
Residual Impact:	Provided that the measures to mitigate the loss of livelihoods are implemented, the residual impact on ecosystem services would be reduced to negligible adverse.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 11-24 Impact on Provisioning Ecosystem Service during Construction

11.12 Community Health, Safety and Security

Health, safety and security of local residents and visitors may be affected during the construction activity through:

- The increase in traffic flows of heavy vehicles and increase of traffic accident risks,
- unauthorised access to the construction site and security risks especially during heavy lifting operations, and
- spread of COVID-19.

11.12.1 Impact on Traffic Safety

The transport of large wind turbine components (blades, tower sections, nacelle) is subject to regulation on safe abnormal loads transport and requires mandatory involvement of police escort with or without successive stopping of traffic (depending on load dimensions). Given that the strict procedure must be implemented, the potential impact of abnormal loads transport is not considered to be a significant traffic safety risk.

Vulnerable road users (pedestrians and cyclists) are primarily present within settlements along the proposed major construction transport route (Pančevo, Bavanište). There are no footpaths on any of the roads out of the settlements. Cycling is predominantly used for transport within the settlements. The potential impact on cyclists and pedestrians out of the settlements is assessed to be of a low magnitude resulting in **minor adverse** impact.

Residential areas are highly sensitive receptors in terms of the traffic safety. The route which would be used for the most part of the construction traffic (Pančevo – Bavanište – WPP site) passes through a residential area in Pančevo where traffic control measures are implemented. Given the high daily traffic in Pančevo area (more than 26,000 vehicles per day), the Project-related vehicles (c. 236 vehicles per day) would not present a significant increase. Upon leaving Pančevo, the route does not intersect any local community before reaching the site. The last stretch of the route is the 1.5km-long municipal road along the outskirts of Bavanište village.

Slow movement of HGVs can cause driver frustration and taking of unnecessary risks, potentially affecting both driver and pedestrian safety along the major construction route. Another potential effect on road safety is transfer of dirt and debris from the construction site to the surrounding road network.

The magnitude of effect in Pančevo would be minor and the impact significance is assessed to be **minor adverse.**

Farmers driving tractors are rare on the major contraction transport route and are more present along the abnormal transport route which would be strictly controlled. Given the low number of tractors, the potential effect is assessed to be of a minor magnitude resulting in **minor adverse** impact.

11.12.2 Unauthorised Access

Safety and security risks for local community may arise from unintentional or intentional entrance to the site, including potential contact with structures or excavations posing safety hazards. If not controlled, the impact is assessed to be **moderate adverse**.

11.12.3 Control of COVID-19

For the time being, COVID-19 remains a major health hazard for both the construction staff and the local community. If not appropriately controlled, the potential impact on the local community is considered to be significant adverse.

11.12.4 Impacts Summary

The slightly increased traffic flows of heavy vehicles along the road between Pančevo and the WPP site is the potential effect of **minor adverse** significance on road safety of pedestrians and drivers in Pančevo. Other sections of the road are considered to be under negligible adverse impact. Unauthorised access to the construction site can have moderate adverse effect on the safety of local residents. Uncontrolled transmission of COVID-19 would have significant adverse impact on the local community.

11.12.5 Proposed Mitigation/ Control Measure

11.12.5.1 Road and Traffic Safety

A Road Safety Management Plan should be developed and implemented (as part of a Construction Transport Management Plan) to define traffic safety procedures including but not limited to: details on vulnerable road users along the route, speed controls, training programmes and licences for all drivers, maintenance of vehicles, monitoring of the road condition (removal of dirt and debris).

Consultation with local traffic police should be held related to potential traffic control measures in the area of Bavanište, in order to decrease the risk for pedestrians crossing the road and their exposure to drivers overtaking HGVs. Temporary signing should be used to highlight the presence of construction traffic.

Discussions with the community of Bavanište should be held in the pre-construction phase to raise awareness on traffic risks during the construction.

Temporary signing should be considered along the 1.5km-long section of the municipal road in Bavanište approaching the development site to make aware the drivers of the construction traffic.

As a result of the proposed measures, the risk of the traffic accidents should be **negligible** for local residents and visitors.

11.12.5.2 Unauthorised Access

All reasonable measures should be taken to ensure that no unauthorised person enters the construction site;

Access to working areas should be restricted, including fencing, signage, and communication of risks to the local community;

A procedure should be developed to ensure that working areas, equipment, tools, machinery do not pose risk to unauthorised visitors.

Provided that the management measures are implemented, there should be no security risk for the local residents.

11.12.5.3 Control of COVID-19

A COVID-19 Management Plan should be developed and implemented. According to Serbian regulatory requirements, the COVID-19 Management Plan must be a result of a formal OHS Risk Assessment. Besides establishing the controls in the workplace, the Management Plan should include measures to prevent the transmission in the local community.

The COVID-19 Management Plan should establish a hierarchy of controls to limit the spread of COVID-19, including technical controls (testing, cleaning and disinfection, immunisation, separation of infected employees), management procedures (communication, training, work instructions, contact with local community, absence from work) and personal protective equipment.

Provided that the COVID-19 Management Plan is implemented, the risk of spread of the virus in the local community should be minimised.

11.12.6 Conclusions

A summary of effects related to community health, safety and security impacts during the construction of the proposed WPP is provided in tables below.

Impact or Opportunity:	Traffic safety risk for local residents and visitors (highly sensitive receptors) in Pančevo and Bavanište due to increased traffic flows.	**Ref. No.:**	
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~		

	Temporary/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	A Road Safety Management Plan should be developed and implemented (as part of a Construction Transport Management Plan) to define traffic safety procedures including but not limited to: details on vulnerable road users along the route, speed controls, training programmes and licences for all drivers, maintenance of vehicles, monitoring of the road condition (removal of dirt and debris). Consultation with local traffic police should be held related to potential traffic control measures in the area of Bavanište in order to decrease the risk for pedestrians crossing the road and their exposure to drivers overtaking HGVs. Temporary signing should be used to highlight the presence of construction traffic. Discussions with the community of Bavanište should be held in the pre-construction phase to raise awareness on traffic risks during the construction. Temporary signing should be considered along the 1.5km-long section of the municipal road in Bavanište approaching the development site to make aware the drivers of the construction traffic.		
Residual Impact:	There should be no traffic safety risk for local residents and visitors.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 11-25 Impact on Traffic Safety during Construction

Impact or Opportunity:	Security risk for local residents, road users and farmers due to unauthorised access to the construction site.		**Ref. No.:**	
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	All reasonable measures should be taken to ensure that no unauthorised person enters the construction site; Access to working areas should be restricted, including fencing, signage, and communication of risks to the local community; A procedure should be developed to ensure that working areas, equipment, tools, machinery do not pose risk to unauthorised visitors.			
Residual Impact:	There should be no security risk for local community.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 11-26 Impact on Public Security during Construction

Impact or Opportunity:	Spread of COVID-19 among the local community (high-sensitive receptor).	**Ref. No.:**	
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		

Impact Mitigation or Opportunity Enhancement:	A COVID-19 Management Plan should be developed and implemented. Besides establishing the controls in the workplace, the Response Plan should include measures to prevent the transmission in the local community. The Management Plan should establish a hierarchy of controls to limit the spread of COVID-19, including technical controls (testing, cleaning and disinfection, immunisation, separation of infected employees), management procedures (communication, training, work instructions, contact with local community, absence from work) and personal protective equipment.		
Residual Impact:	There should be no risk of spread of COVID-19 in the local community.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 11-27 Control of COVID-19

12 Operation - Impact Assessment and Mitigations

12.1 Introduction

This Chapter describes the assessment and mitigation of the operational impacts identified within the Scoping Study. The impact topics are presented in the order of significance identified by the Scoping Study. A summary of the impacts identified and recommended mitigation or control measures are presented in one or more tables at the end of each topic section. These impacts, mitigations and control measures are consolidated in a single table in Chapter 16. The Operation impact summary table is linked to the Environmental and Social Monitoring and Management Plan (ESMMP) presented in Chapter 17. The ESMMP will be used as the basis of the Operation Environmental and Social Management Plan (OESMP). The OESMP will include a series of subsidiary, topic specific Management Plans (see Chapter 15) that will describe the procedures and controls required to manage the impacts in line with the Project Applicable Requirements (see section 2.7).

The Scoping Study categorised the operational impacts of Čibuk 2 as:

Significance Level One Issues

- Ecology and Nature Conservation – potential impact on birds;
- Ecology and Nature Conservation – potential impact on bats;
- Landscape and Visual;
- Shadow Flicker.

Significance Level Two Issues

- Socio-economic;
- Traffic and Transport;
- Operational Noise.

Significance Level Three Issues

- Ecology and Nature Conservation – potential impacts on habitats & species other than birds & bats;
- Surface Water and Effluent;
- Aviation Safety and Radars Obstructions;
- Electromagnetic Interference and Telecommunication;
- Ecosystem Services;
- Air Quality;
- Community Health, Safety and Security.

12.2 Ecology and Nature Conservation

This section identifies, characterises and evaluates all potential operation impacts of the Čibuk 2 WPP project on ecological features of significant nature conservation value, identifies and describes mitigation measures needed as well as provides an assessment of the significance of any residual effects.

Only those ecological features considered to be potentially affected by the project and of significant nature conservation value should be subject to detailed impact assessment (CIEEM 2016). For ecological features of not significant nature conservation value (valued at the local level at the most), no detailed impact assessment is needed (CIEEM 2016, SNH 2018a) since any potential impact could only be not significant as well (CIEEM 2016, European Commission 2020).

12.2.1 Impact Assessment

12.2.1.1 Designated Sites

There is the potential for impacts on designated sites fauna species populations, in particular birds and bats, and these are considered in the following sections.

12.2.1.2 Habitats

There are no direct negative impacts of WPP operation on habitats. This assumes that all maintenance vehicles and activities are restricted to the newly constructed tracks and the maintenance platforms that will be constructed next to each WTG.

12.2.1.3 Flora and Fauna

All flora and fauna, excluding birds and bats, populations and their habitats within the site boundary are of insignificant nature conservation value (valued at the local level at the most, see section 0). Therefore, any potential impact could only be **not significant** as well.

Illegal activities, such as deliberate destruction of protected flora species individuals /populations and deliberate killing of protected fauna species (including destruction of nests/ roosts/ lairs/ habitations, eggs and litters), are not considered, since they must be prevented under Law.

12.2.1.4 Birds

All possible impacts on all bird species populations occurring within the site boundary are considered in this section including displacement due to operation and collision mortality from WTGs.

The magnitude, direction and scale of potential impacts were assessed based on occurring populations' nature conservation value (Table 7-5), ecological status (

Table 7-4) and size (Table 7-1, Table 7-2) within the site, as well as species ecology and susceptibility to potential impacts, and encompassing populations' size and other demographics (Appendix C).

Illegal activities, such as deliberate killing of protected bird species (including destruction of nests and eggs), are not considered, since they must be prevented under Law.

12.2.1.4.1 Displacement

Operational displacement is where birds are excluded from the areas (of WPP and its surrounding) that were suitable for them before the development, due to avoidance of the operating WTGs or maintenance activities. It may also include barrier effects in which birds are deterred from using normal commuting or migration routes and prevented from reaching some destination due to WPP acting as a barrier along the route (SNH 2017, 2018a).

There are no bird migration or commuting routes in the site are. Therefore, any **barrier effect** is positively excluded, and **no impact** is ascertained for all bird species populations..

The majority of the bird populations using the habitats within the site for nesting and/or foraging are already habituated to constant human presence and intense activities in the area, including the use of agricultural machinery in particular, and not very susceptible to the disturbance that will be caused by **maintenance**. Although maintenance may cause some localised and short-term disturbance, this cannot be considered displacement. Therefore, **no impact** is assessed for all bird species populations (including those of significant nature conservation value).

Individuals of all occurring populations, either using the site or only flying over it, will certainly exhibit avoidance behaviour towards operating WTGs or take other evasive action to prevent a collision. However, this is considered displacement only if such behaviour results in a change of home range, territory, or flight route (possibly over time), so that bird no longer uses the area (or parts) of the operational WPP or flight route above (SNH 2012).

All occurring bird populations of significant nature conservation value use the site for nesting and/ or foraging. The populations using the habitats within the site for nesting and/or foraging, again, are already habituated to intense human activities in the area. Furthermore, according to current knowledge, there is no indication that nesting and/ or foraging of most of these species is susceptible to displacement from operating WTGs (see Appendix C). Common Kestrel (*Falco tinnunculus*) susceptibility suspected by European Commission (2010) has been positively disproved, at least for breeding populations (Hötker *et al.* 2006, Gove *et al.* 2013). Although avoidance behaviour will cause a slight increase in birds' energy expenditure, this cannot be considered displacement. Therefore, **no impact** of displacement from **operating WTGs** is assessed for **most** of the **populations** of significant nature conservation value.

There are only a few possible exceptions, to some extent: Common Quail (*Coturnix coturnix*), Hen Harrier (*Circus cyaneus*), Saker Falcon (*Falco cherrug*), and Tawny Pipit (*Anthus campestris*). These are analysed in more detail bellow.

Saker Falcon foraging is susceptible to displacement to some extent, through avoidance behaviour exhibited towards operating WTGs, in particular at large-scale, densely built WPPs (Prommer & Bagyura 2015). However, foraging habitats within the site are of negligible value, even if a new home range will be established on site margin, and thus only negligible impact on foraging may occur. Available published sources consider species nesting to be not susceptible to displacement, since OHL pylons within WPPs are not avoided (Prommer & Bagyura 2015). However, unpublished studies indicate that nests on OHL pylons completely surrounded by large-scale WPPs, and subsequently corresponding home ranges, could be abandoned (S. Puzović 2020, official communication, 25 April, PZZP). Since there is no occupied home range in the site area, nesting of the species cannot be affected by the Project. An utmost precaution may be justified because of indication that a new home range could be established on north site margin (see section 7.3.5.1.4), whilst the species is globally endangered and scarce (BirdLife International 2021, IUCN 2022). It is not possible to determine with certainty where would the nest the be located, although, based on the observed activity (and species ecology), it is considered the most likely that it would be on an OHL pylon in the area between the Čibuk 1 and Čibuk 2 sites and Dolovo village. All of the OHL pylons in this area are located at more than 2 km from Čibuk 2 WTGs which is considered a safe distance, and thus no displacement or even disturbance is considered possible even if a new home range will be established. Considering all the above, the impact of displacement on the **Saker Falcon resident population** is assessed as **negligible** with regard to foraging and **none** on nesting even as an utmost precaution, and thus **not significant**.

The single source (Pearce-Higgins *et al.* 2009) reports Hen Harrier flight activity to be reduced by ca. 50% within 500 m of operating WTGs. It is noted that these findings may not apply to the local situation, since they relate to a breeding population of the species, non-farmland habitats and by far lower WTG models (height to the hub 30-70 m). However, since susceptibility to displacement is more species- than season-specific and generally higher outside the breeding season in each species (Hötker *et al.* 2006, Gove *et al.* 2013), whilst the population using the habitats within the WPP site is considered habituated to intense human activities in the area, it is still considered that these findings could be applicable to this ESIA as well, at least as a worst-case. Therefore, following the precautionary approach, if a 500 m radius area around each of the WTGs would be affected, the effect of displacement would be 50% reduced flight activity at 41.4% of the WPP site area. This obviously does not equate to effective loss of habitat and, in particular not to population loss or range reduction. It is not considered likely that even population density could be affected locally as larger share of foraging habitats within the site will remain unaffected. Considering also that only single individuals of the species occur at the site, and that larger unaffected areas of foraging habitats are present in the surroundings, it is concluded that the sustainability of the population will not be affected even at the local level. Therefore, the impact of displacement on the **Hen Harrier wintering population** foraging is assessed as **negligible**, and thus **not significant**.

A potentially significant impact on the population sustainability of the remaining two species cannot be immediately excluded. Therefore, a detailed assessment of the potentially affected population sensitivity to population loss due to displacement is considered needed. In the absence of detailed demographic data, the PBR methodology (Niel & Lebreton 2005, Dillingham & Fletcher 2008) was used to estimate the sustainability limits of the potentially affected population.

Calculated harvest rates for both potentially affected populations are presented in Table 12-1, along with maximum population loss due to displacement, as an equivalent to habitat loss from displacement (SNH 2012, 2018a, as elaborated below for each potentially affected species), for direct comparison. It is noted that population loss from displacement is not likely entirely equivalent to habitat loss but rather lower, though it is taken as such here as a worst-case following precautionary approach. All the details on parameters and all calculations are provided in Appendix C.

The likely effect of displacement on the sustainability of potentially affected populations was evaluated by direct comparison of estimated population loss and harvest rates for the particular (sub)population. Displacement is considered sustainable when worst-case population loss due to displacement is below the allowable harvest rate, and unsustainable when above maximum harvest rate, whilst any value between would need further investigation (Dillingham & Fletcher 2008).

When the impact of displacement at the lower level of the extent (geographical scale), i.e. on a smaller (sub)population, is evaluated as sustainable, sustainability at the higher scale is ascertained, and mortally rates of larger encompassing population have not been included in Table 12-1 for clearer presentation (although calculated and available in Appendix C).

Table 12-1 Estimated Effect of the Worst-Case Population Loss from Displacement at the Čibuk 2 WPP on the Sustainability of Potentially Affected Populations

Legend and notes

No. - same as in

Table 7-4, for convenience;

Potentially affected (sub)population - defined by source and character (breeding, migrating or wintering);

Annual harvest rate

h_a = allowable harvest rate (additional human-caused mortality rate likely to be sustainable) - calculated according to Niel &Lebreton (2005) and Dillingham & Fletcher (2008),

h_{max} = maximum harvest rate (maximum mortality rate that could possibly be sustainable) - calculated according to Niel &Lebreton (2005) and Dillingham & Fletcher (2008);

Population loss from displacement - maximal population loss from displacement as an equivalent of habitat loss due to displacement - unsustainable in **red**, sustainable in **blue**.

No.	Species name		Potentially affected (sub-)population	Annual harvest rate (%)		Population loss from displacement (%)
	Scientific	English		h_a	h_{max}	
1	*Coturnix coturnix*	Common Quail	local/site, breeding	2.83	42.13	**6.62**
			South Banat, breeding	3.91	42.13	**0.37**
128	*Anthus campestris*	Tawny Pipit	local/site, breeding	26.81	33.80	**1.66**
			South Banat, breeding	31.83	33.80	**0.06**

Some sources (e.g. Reichenbach *et al.* 2004) consider Common Quail susceptible to displacement from operating WTGs and assess that breeding/display territories within 200 m of the WTGs may be abandoned. Other sources dispute this based on surveys at operating WPPs (e.g. Möckel & Wiesner 2007) and/or conclude that the species habituates to disturbance from WTG operations (Hötker *et al.* 2006). It is considered that in such cases contradicting findings arose from site-specific issues (Gove *et al.* 2013). The occurring population is already habituated to intense human activities (use of agricultural machinery) in the area, and thus it is considered likely that site-and-population-specific risk of displacement is negligible. Following precautionary approach only, if 200 m from the WTGs would be effectively lost, this would result in an effective loss of 6.62% of the habitat within the site, and thus possibly affect the equivalent share of the local population of the species, which equates to about 0.37% of the regional. The equivalent population loss would only be possibly unsustainable at the site level, though sustainable for the potentially affected population at the relevant (regional or higher) scale. Considering all the above, the impact of displacement on the **Common Quail breeding population** is assessed as **likely none**, and, only following precautionary approach, *possibly minor negative local*, and evaluated accordingly as **not significant**.

Neither nesting nor foraging of Tawny Pipit is known to be susceptible to displacement from operating WTGs. The single source (Pearce-Higgins *et al.* 2009) found sibling Meadow Pipit (*Anthus pratensis*) to be displaced within 100 m of the WTGs, but other sources found no indication of displacement of either of the sibling species and even confirm that they habituate to disturbance from WTG operations (e.g. Hötker *et al.* 2006, Gove *et al.* 2013). Contradicting findings are considered indicative of site-specific issues (Gove *et al.* 2013). The occurring population is already habituated to intense human activities (use of agricultural machinery and operation of oil/gas extraction facilities) in the area, and thus it is considered likely that site-and-population-specific risk of displacement is negligible. Following the precautionary approach, although considered highly unlikely, if 100 m from the WTGs would be effectively lost, this would result in the effective loss of 1.66% habitat within the site. However, equivalent population loss would still be sustainable for potentially affected population even at the site level, and thus also at any higher scale. Considering all the above, the impact of displacement on the **Tawny Pipit breeding population** is assessed as **likely none**, and, only following precautionary approach, *possibly negligible* at the most even at the site level, and evaluated accordingly as **not significant**.

12.2.1.4.2 Collision mortality from WTGs

Mortality through collision occurs when a bird flies into an element of WPP infrastructure and is killed either from the impact, subsequent impact with the ground, or from injuries sustained in the process (SNH 2017, 2018a). The WPP infrastructure elements considered to pose the highest risk for collision are moving WTG blades.

A total of 9 target species were recorded by these Čibuk 2 ESIA surveys. However, 3 of these target species were only recorded during the Breeding Bird Surveys or by occasional observations: Little Owl (*Athene noctula*), Long-eared Owl (*Asio otus*), and Saker Falcon (*Falco cherrug*). Since flight activity was not recorded during the VP Surveys, it is not possible to model collision risk for these species.

Since both of these owl species were recorded within the site boundary in low or negligible numbers, whilst their species-specific susceptibility to collision is negligible at the most (Hötker *et al.* 2006, European Commission 2010, Gove *et al.* 2013), the site-and-population-specific collision risk of both these species must be considered to be negligible at the most. Although incidental collision fatalities of these species cannot be excluded, such low (potential) additional mortality could not affect their populations sustainability even at the site level. Therefore, **no impact** of collision mortality from the WTGs on **Little Owl** and **Long-eared Owl** populations can be ascertained.

Neither flight activity of the Saker Falcon was recorded by the ESIA VP Surveys within the site boundary, nor nesting in the site area by the ESIA Breeding Raptor Surveys. Also, no fatalities have ever been recorded at WPPs in Europe (Dürr 2021b) even when nesting on OHL pylons within WPP and despite the assumed risk for fledglings (Prommer & Bagyura 2015). Based on this only, it could appear that there is no site-and-population-specific collision risk. However, an utmost precaution may be justified because of indication that a new home range of Saker Falcon could be established on north site margin in near future(see section 7.3.5.1.4), whilst the species is globally endangered and scarce (BirdLife International 2021, IUCN 2022), at Serbian level in particular (Rajković & Puzović 2018). If the new home range will be occupied, based on the observations so far (and species ecology), it is considered the most likely that the future nesting location would be on an OHL pylon in the area between the Čibuk 1 and Čibuk 2 sites and Dolovo village and that the birds' flight activity within the site will remain restricted to northeast margin. This means that only a minor share of the flight activity could fell within the area of WTGs, whilst the nest would be located at a safe distance (more than 2 km from Čibuk 2 WTGs), and thus that both adults and fledglings could only incidentally be exposed to collision risk. Therefore, even if the new home range will be occupied, the site-and-population-specific collision risk of Saker Falcon will highly likely be negligible at the most. Considering also none (or low at the most) species-specific susceptibility to collision, the impact of collision mortality on **Saker Falcon population** at all levels is assessed as **negligible**, and thus **not significant**, even following the most precautionary approach.

A total of 6 target species was recorded within the scope of the 2021-2022 ESIA VP Surveys (Table 7-3). Their site-and-population-specific collision risk with WTG blades was modelled using SNH methodology for two scenarios. Collision risk indices calculated from flight activity data are presented in Table 12-2, whilst all the details on parameters and calculations are available in Appendix C.

Table 12-2 Estimated Collision Risk for Target Species Recorded at the Čibuk 2 WPP Site

Legend and notes

Calculated using SNH CRM (SNH 2000, 2014a, 2018b, Chamberlain *et al.* 2005, Band *et al.* 2007).

The highest risk value (worst-case) for each species in relation to the WTG model is in **bold.**

No. - same as in

Table 7-4, for convenience.

Hub-height scenarios

115 m - blade swept height 30-200 m, maximal chord width of blade 4.50 m;

155 m - blade swept height70 240 m, maximal chord width of blade 4.50 m.

No.	Species name		Number of birds colliding annually		Number of years per collision		Number of birds colliding over lifespan of project (25 years)	
	Scientific	English	115 m	155 m	115 m	155 m	115 m	155 m
42	*Circus aeruginosus*	Western Marsh Harrier	**0.22**	0.04	**4.65**	27.81	**5.38**	0.90
43	*Circus cyaneus*	Hen Harrier	**0.07**	0.02	**14.29**	59.26	**1.75**	0.42
51	*Buteo buteo*	Common Buzzard	**2.72**	1.88	**0.37**	0.53	**67.90**	46.88
53	*Merops apiaster*	European Bee-eater	**1.14**	0.40	**0.87**	2.47	**28.61**	10.12
54	*Coracias garrulus*	European Roller	*Not observed at a blade swept height*					
62	*Falco tinnunculus*	Common Kestrel	**3.30**	0.86	**0.30**	1.16	**82.54**	21.61

The data in Table 12-2 clearly illustrates that collision risk depends on hub-height. It is evident that the lower hub-height generates higher risk for all species as it has lower blade swept height, many times higher for some of the species. This is because all these species spend more flight time at lower altitudes (closer to the ground and/ or vegetation).

No collision risk is predicted from CRM for the European Roller (*Coracias garrulus*). Although incidental collision fatalities of this species cannot be excluded, such low (potential) additional mortality could not affect its population even at the site level. Therefore, **no impact** of collision mortality from the WTGs is assessed for the **European Roller** and this species is not subjected to further detailed assessment.

A potentially significant impact on the population sustainability of the remaining seven species cannot be immediately excluded. Therefore, a detailed assessment of the potentially affected population sensitivity to additional mortality from collision is considered needed. In the absence of detailed demographic data, the PBR methodology (Niel & Lebreton 2005, Dillingham & Fletcher 2008) was used to estimate the sustainability limits of the potentially affected population.

Calculated harvest rates for all potentially affected populations are presented in Table 12-3, along with estimated mortality rates from collision, for direct comparison. All the details on parameters and all calculations are provided in Appendix C.

The likely effect of collision mortality on the sustainability of potentially affected populations was evaluated by direct comparison of estimated worst-case mortality rate from collision and harvest rates for the particular (sub)population. Collision mortality is considered sustainable when below the allowable harvest rate, and unsustainable when above maximum harvest rate, whilst any value between would need further investigation (Dillingham & Fletcher 2008).

When collision mortality at the lower level of the extent (geographical scale), i.e. on a smaller, (sub)population, is evaluated as sustainable, sustainability at the higher scale is ascertained, and mortally rates of larger encompassing population have not been included in Table 12-3 for clearer presentation (although calculated and available in Appendix C).

Table 12-3 Estimated Effect of the Worst-Case Collision Mortality at the Čibuk 2 WPP on the Sustainability of Target Species Populations

Legend and notes

No in column 1. - same as in

Table 7-4, for convenience;

Potentially affected (sub-) population - defined by source and character (breeding, migrating or wintering) ;

Annual harvest rate

h_a = allowable harvest rate (additional human-caused mortality rate likely to be sustainable) - calculated according to Niel &Lebreton (2005) and Dillingham & Fletcher (2008),

h_{max} = maximum harvest rate (maximum mortality rate that could possibly be sustainable) - calculated according to Niel &Lebreton (2005) and Dillingham & Fletcher (2008) ;

from collision = n_c / N_{min} (n_c = number of birds colliding annually, from CRM (Table 12-2) ; N_{min} = conservative population size estimate, calculated according to Dillingham & Fletcher (2008)) - unsustainable in **red**, sustainable in **blue**.

No.	Species name		Potentially affected (sub)population	Annual harvest rate (%)		
	Scientific	Scientific		h_a	h_{max}	from collision
42	*Circus aeruginosus*	Western Marsh Harrier	South Banat, breeding	2.91	11.01	**0.10**
43	*Circus cyaneus*	Hen Harrier	Serbia, wintering	0.97	13.22	**0.02**
51	*Buteo buteo*	Common Buzzard	South Banat, breeding	7.13	7.61	**0.55**
53	*Merops apiaster*	European Bee-eater	South Banat, breeding	35.53	40.62	**0.03**
62	*Falco tinnunculus*	Common Kestrel	local/site, breeding	27.84	27.84	**23.58**
			South Banat, breeding	26.22	27.84	**0.30**

The sustainable effect of collision mortality was predicted for all 6 assessed potentially affected species populations: Western Marsh Harrier (*Circus aeruginosus*), Hen Harrier (*Circus cyaneus*), Common Buzzard (*Buteo buteo*), European Bee-eater (*Merops apiaster*), and Common Kestrel (*Falco tinnunculus*). Therefore, **negligible**, and **not significant**, impact of collision mortality from WTGs on these **6 species** populations is assessed.

12.2.1.5 Bats

This section considers the potential impact of the WPP on all bat species populations occurring within the site boundary, principally operational mortality through collision or barotrauma caused by operating WTG blades.

The magnitude, direction and scale of potential impacts were assessed based on occurring populations' nature conservation value (Table 7-8), ecological status (Table 7-7, Figure 7-25) and size (Table 12-4) within the site, as well as species ecology and susceptibility to potential impacts, and encompassing populations' size and other demographics (Appendix C).

12.2.1.5.1 Operational mortality

EUROBATS established the concept that "*the most significant impact of operating wind turbines on bats is direct killing, caused due to collision and/ or barotrauma. Migrating bats and bats from local sedentary populations are often killed by wind turbines, sometimes in large numbers*."

The risk of bat operational mortality from operating WTGs cannot be predicted on the basis of the pre-construction surveys activity data in the same way that collision risk modelling is used to predict bird mortality. Therefore, the assessment of impact of bat operational mortality is undertaken as follows:

- The site-and-population-specific **risk** of mortality must initially be estimated on the basis of occurring populations' ecological status and habitat use at the site. Particular consideration is given to the presence and location of commuting routes and foraging areas, and species-specific susceptibility to mortality from operating WTGs.
- The **sensitivity** of the potentially affected population is then estimated on the basis of population nature conservation value and size.
- The effect of operational mortality on the **sustainability** of the potentially affected population is finally estimated using PBR methodology.
- On the basis of site-and-population-specific mortality risk and population sensitivity, the operational mortality rates are estimated and their effect on the **sustainability** of the potentially affected population is evaluated using PBR methodology (Niel & Lebreton 2005, Dillingham & Fletcher 2008). Operational mortality is considered sustainable when below the allowable harvest, and unsustainable when above maximum harvest, whilst any value between would need further investigation.

It is important to note that the Primary Mitigation already adopted within the Zoning Plan ensures that no WTG will sited in the areas where flight activity of any bat species is expected to be regularly high (i.e. woodland/scrub, marshland and wetland, Figure 7-18) and thus the risk of operational mortality is minimised for all of the occurring species. Also, even the most important foraging areas and commuting routes within the site (Figure 7-25) are of moderate local nature conservation value at the most, whilst the activity of none of the species is regularly high anywhere within the site. The a overall activity is considered to be regularly moderate only in the area of WTGs 20 and 33, and incidentally moderate in the area of WTG 14, whilst in the area of all other surveyed WTGs it is regularly low or negligible. Therefore, site-and-population-specific mortality risk is not considered high for any of the occurring species.

Habitats within the site are of negligible value for most of the occurring bat species and most of the species does not have the least important foraging areas and commuting routes within the site. When considering the low species-specific susceptibility to operational mortality, as well as the negligible to low activity and abundance at the site, a negligible site-and-population-specific mortality risk is concluded for most of the occurring species. Since even incidental single fatalities of these species can be largely excluded, the sustainability of potentially affected populations is predicted even at the local level. Therefore, **no impact** of operational mortality on **most species** populations is assessed.

There are 6 species which are possible exception to this (including two (highlighted) whose populations of significant nature conservation value occur within the site): Soprano Pipistrelle Bat (*Pipistrellus pygmaeus*), Kuhl's Pipistrelle Bat (*Pipistrellus kuhlii*), **Nathusius' Pipistrelle Bat** (*Pipistrellus nathusii*), Parti-coloured Bat (*Vespertilio murinus*), **Leisler's Bat** (*Nyctalus leisleri*), and Noctule Bat (*Nyctalus noctula*). Habitats within the site are of local value for these species, their foraging areas and commuting routes of some importance, and their activity is at least occasionally and/or locally moderate or higher.

Considering high species-specific susceptibility to operational mortality, a potentially significant impact of the operational mortality on population sustainability of all 6 species cannot be immediately excluded. Therefore, a detailed assessment of the potentially affected population sensitivity to additional mortality is considered needed, and the PBR methodology was used to estimate the sustainability limits of the potentially affected population.

Calculated sustainability limits for all potentially affected regional (South Banat) populations are presented in Table 12-4, along with estimated populations using the WPP site, for direct comparison. All the details on parameters and all calculations are provided in Appendix C.

Simply put, mortality is considered sustainable when it remains below the allowable mortality, and unsustainable when above maximum mortality. This means that (cumulative) operational fatalities must not exceed the calculated allowable mortality (M_a in Table 12-4).

Table 12-4 Site Population Estimates and Sustainability Limits of Regional Populations of Bat Species Highly Susceptible to Mortality from Operating WTGs

Legend and notes

<u>Čibuk 2 WPP site population estimate</u> (number of adult individuals) – estimated on the basis of the ESIA Bat Survey: minimum-maximum, () - migratory population;

<u>Annual mortality sustainability limits</u> (number of fatalities):

M_a - allowable harvest (i.e. additional human-caused mortality likely to be sustainable) = h_a x N_{min} [h_a = allowable harvest rate, N_{min} = conservative population size estimate, calculated according to Niel &Lebreton (2005) and Dillingham & Fletcher (2008)];

M_{max} - maximum harvest (maximum mortality rate that could possibly be sustainable) = h_{max} x N_{min} [h_{max} = maximum harvest rate, N_{min} = conservative population size estimate, calculated according to Niel &Lebreton (2005) and Dillingham & Fletcher (2008)].

Occurring populations of significant nature conservation value are highlighted.

Species name		Čibuk 2 WPP site population estimate	Annual mortality sustainability limits	
Scientific	English		M_a	M_{max}
Pipistrellus pygmaeus	Soprano Pipistrelle Bat	(5-10)	544	686
Pipistrellus kuhlii	Kuhl's Pipistrelle Bat	50-100	4470	6099
Pipistrellus nathusii	Nathusius' Pipistrelle Bat	10-15 + (10-20)	352	417
Vespertilio murinus	Parti-coloured Bat	(5-10)	324	384
Nyctalus leisleri	Leisler's Bat	1-5 + (5-10)	203	903

Species name		Čibuk 2 WPP site population estimate	Annual mortality sustainability limits	
Scientific	English		M_a	M_{max}
Nyctalus noctula	Noctule Bat	10-15 + (30-50)	1525	3130

It is noted that the whole site populations (in pre-construction period) of all species considered highly susceptible to mortality from operating WTGs were smaller than the allowable mortality (Table 12-4). Therefore, the unsustainable mortality of all the species is considered extremely unlikely.

It is important to note that these analyses are based on pre-construction surveys, whilst bat activity is very likely to increase within the site boundary following construction as many bat species are often attracted to WPPs (Rodrigues *et al*. 2015). Although particular care was taken in this assessment to identify such possible changes (e.g. benefits to commuting and foraging of certain species from development of the tracks), some of the changes remain unpredictable. Therefore, even a significant increase in bat population numbers and activity at the site and following construction, including particularly species considered highly susceptible to operational mortality, is considered possible. Such increase may result in mortality rates which significantly exceed the expectations based on pre-construction surveys, as recorded by the Mortality Monitoring surveys at some other WPPs in South Banat. As a precaution, such unpredicted mortality rates must be considered as a possible worst-case, and unsustainable mortality rates can never be completely excluded for any highly susceptible species that have foraging areas and commuting routes of at least some importance within the site. At the Čibuk 2 WPP site, these are all 6 species listed in the Table 12-4, including both whose populations of significant nature conservation value occur within the site.

Potentially the highest risk is associated with the Čibuk 2 WTGs 33, 25, and 22. This is because these WTGs are located in the areas of the most important foraging areas and commuting routes within the site and where the highest activity of most of these species at the site is recorded.

It should also be noted that there are already 4 WPPs, with over 140 WTGs, operational in the region, and even more in different development stages. All of these WPPs will inevitably cause some bat fatalities which will have a cumulative (additive) effect on the regional populations, and the cumulative effects of operational mortality are identified as a potential concern for the sustainability of the regional bat populations (IFC 2019b, this ESIA).

Due to all the above, the impact of operational mortality on Soprano Pipistrelle Bat, Kuhl's Pipistrelle Bat, Nathusius' Pipistrelle Bat, Parti-coloured Bat, Leisler's Bat, and Noctule Bat is assessed as **likely negligible**, and, as a precaution, ***possibly low negative regional***, and evaluated accordingly as **likely not significant** and ***possibly* significant**.

12.2.2 Impacts Summary

Primary Mitigation already adopted within the Zoning Plan ensures that potential negative impacts of the Project on various ecological features are avoided or significantly reduced.

The ESIA concludes that there will be **no** or **not significant** impact of WPP operation on any **designated site**, **habitat**, flora and fauna **population**, including **birds** and **most bats**, whilst only impacts on ***6 bat*** species populations will be, as a precaution, ***possibly* significant**, though still **likely not significant**.

WTG operation will cause some disturbance to bird activities, though this cannot be considered displacement for most species and **no** impact can be ascertained. Detailed assessment of sustainability of several species populations of significant conservation value and potentially susceptible to displacement, undertaken as a precaution, clearly indicate that there will be a **negligible** impact at the most on the regional populations of Common Quail, Hen Harrier, Saker Falcon, and Tawny Pipit.

Some bird collision fatalities from WTGs are inevitable. The collision risk assessment and assessment of sustainability of the potentially affected populations concludes that there will be a **negligible** impact on the regional populations of Western Marsh Harrier, Hen Harrier, Common Buzzard, European Bee-eater, and Saker Falcon. The remaining species observed within the WPP site are considered not susceptible to collision mortality or of insignificant nature conservation value, or occur at the site only incidentally. Although incidental single collision fatalities of these species as well cannot be completely excluded, such a low (potential) additional mortality could not affect their populations even at the site level, and **no** impact on population sustainability can be ascertained.

Although no impacts on population sustainability are predicted based on recent survey data and the PBR assessment, actual impacts of operation will be monitored by GIIP fatality monitoring as part of an Adaptive Management Plan (AMP).

Some bat fatalities from operational WTGs are also inevitable. The impact on the majority of occurring bat populations from mortality caused by operating WTGs is assessed as **none**. The assessment of sustainability of the potentially affected populations concludes that the impact on the highly susceptible species regional populations, the Soprano Pipistrelle Bat, Kuhl's Pipistrelle Bat, Nathusius' Pipistrelle Bat, Parti-coloured Bat, Leisler's Bat, and Noctule Bat, including resident and migratory populations of Leisler's Bat and total population of Nathusius' Pipistrelle Bat of significant conservation value, is **likely negligible**, and, as a precaution, ***possibly low negative regional***. WTGs in the areas of established foraging areas and commuting routes of these species have been identified as potentially the most harmful.

12.2.3 Proposed Mitigation/ Control Measures and Significance of Residual Impacts

Primary Mitigation of the potential impacts on habitats, flora and fauna was achieved through design changes of the WPP layout, which are already adopted within the Zoning Plan. These changes provided a comprehensive set of measures to avoid and minimise negative effects of the Project on various ecological features.

The **targeted mitigation** is proposed to mitigate the worst-case scenario of bat operational mortality, i.e. possible significant negative impact on potentially affected populations: Soprano Pipistrelle Bat, Kuhl's Pipistrelle Bat, Nathusius' Pipistrelle Bat, Parti-coloured Bat, Leisler's Bat, and Noctule Bat (see below). Along with the target cancellation of the WTGs, the targeted shut down of WTGs located in the areas where this impact is predicted, during periods and weather conditions of predicted impact, is the only mitigation proven to be effective (Rodrigues *et al*. 2015).

The Primary Mitigation, along with proposed targeted mitigation, adherence to legal requirements, NPCs and generic GIIP implemented through the ESMMP, will ensure that all potential negative impacts of the Project on any ecological features are avoided or minimised, and the ESIA concludes that only **not significant** negative **residual** effects could occur.

The **legal obligations** imposed by the Law on Nature Protection are also applicable during operation. Enforcement of these general measures during the operation as well must be ensured through the Project Management Plans (OESMP), along with other generic GIIP aimed at minimising operation impacts on all habitats and species.

In line with the requirements of PR/PS 6, and the NPCs, an **adaptive management** plan should be adopted "*in which the implementation of mitigation and management measures are responsive to changing conditions and the results of project monitoring throughout the project life cycle*". This is of particular importance considering inherent uncertainty in predicting bat operational mortality, and future consideration should be given to the careful use shutdown programmes to mitigate excessive bat mortality.

Monitoring of the operational impacts on birds and bats is required by the Law, the NPCs and the PR/PS 6. A comprehensive programme to monitor impacts of the Čibuk 1 WPP on birds and bats, was developed in full compliance with all applicable requirements, standards, guidance, GIIP, and up-to-date science, agreed with the IfNCV and Lenders, and is implemented as an integral part of the Project OESMP since July 2020 (Karapandža & Paunović 2020). The Čibuk 1 WPP Monitoring Programme includes bird and bat activity and mortality surveys, and the fully elaborated methodology (Karapandža & Paunović 2020) is provided in Appendix C. The methodological design of the Čibuk 2 WPP Monitoring Programme should be based on the methodology implemented in the Čibuk 1 WPP Monitoring Programme and this ESIA surveys (see section 6.3.3) to maximise compatibility and comparability of the results. Detailed Čibuk 2 WPP Monitoring Programme should be agreed with the IfNCV and Lenders, integrated into the Project OESMP and implemented as it's integral part. Outline of the key elements of the post-construction Monitoring Programme is provided below.

Bird Survey Plan

- Breeding Raptor Surveys (Saker Falcon in particular, as required by the NPC):
  - Total counts of occupied home ranges and active nests using walkover survey and territory mapping (Hardey *et al.* 2009),
  - The survey area extending 2 km beyond the site boundary;
- Breeding Farmland Bird Surveys (notably for IBA species):
  - Breeding Bird Survey methodology from Gilbert *et al.* (1998),

- Transect surveys covering all WTG locations;

- Vantage Point Surveys:
  - SNH (2009, 2016, 2017) survey methodology,
  - VPs location as in Figure 6-1;
  - Increased winter VP hours if IBA goose species recorded in the area;
- Winter Bird Surveys (targeting IBA goose species):
  - Transect survey effort to be triggered by recorded activity during winter VP surveys i.e. potential for IBA goose species to be feeding/roosting within or adjacent to the WPP.

Bat Survey Plan

- Automated Monitoring of Activity at Nacelle Height (legally required):
  - Automated bat registration systems are to be installed at WTGs 8, 12, 22, 28, 33 and 34.
  - Full analyses of the recordings (to attribute bat calls to particular species groups) from 5 consecutive nights per month, only counts of bat calls for all remaining nights.

Bird and Bat Mortality Survey Plan

Bird and Bat Fatality Monitoring will follow GIIP and, should it be available, the upcoming IFC fatality monitoring guidance. This will include (but not be limited to):

- Monitoring setup and initial training;
- Carcass Searches – systematic surveys for bird and bat fatalities around each WTG, within the areas enabling efficient searches (road-and-pad);
- Bias-correction Trials: Unsearched Area Correction Trials, Searcher Efficiency Trials, Carcass Removal Trials;
- Estimation of mortality rates – using appropriate modelling methods (*Evidence of Absence* software preferably, or possibly also *GenEst* software or www.wildlifefatalityestimator.com internet platform).

According to (IFC 2012b, EBRD 2019), an initial period of 3 years is likely to be required for Bird and Bat Mortality Surveys. For other elements of the Monitoring Programme, an initial period of one full year is proposed. After these periods, in accordance with the findings and in consultation with IfNCV and Lenders, the need for continuation and the scope of further monitoring would be assessed.

12.2.4 Conclusions

A summary of potential impacts of operation on ecological features is provided in tables below.

Impact or Opportunity:	Operational mortality of six highly susceptible bat species, including resident and migratory populations of Leisler's Bat and total population of Nathusius' Pipistrelle Bat of significant conservation value.	**Ref. No.:**	28
Characteristics of the Impact or Opportunity:	~~Positive/~~ **Negative** **Direct**~~/ Indirect~~ ~~Temporary/ Short-term/ Medium-term/~~ **Long-term**~~/ Permanent~~ ~~Local/ National/~~ **Regional**		
Impact Mitigation or Opportunity Enhancement:	Conditional shutdown programme of WTGs 22, 33, and 25. The preliminary shutdown programme must be prepared for implementation at these WTGs from 15 March until 15 November, from sunset until sunrise when all the following thresholds are met: • wind speed (measured from nacelle) 6 m/s or bellow, • temperature 10°C or above, • no heavy rainfall. The proposed shutdown programme would only be implemented if unsustainable mortality of the particular populations is recorded by the post-construction monitoring mortality surveys. In such a case, immediate implementation of the shutdown programme is crucial to effectively mitigate fatalities. Therefore, the shutdown		

	programme must be prepared and ready for implementation should it be needed. The conditional shutdown programme should be implemented through OESMP.		
Residual Impact:	**Negligible** to **minor negative local** and not significant.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 12-5 Operational Mortality of Six Highly Susceptible Bat Species

12.3 Socio-Economic

Socio-economic impacts associated with Project operation activities have been grouped and presented under the following headings:

- Impacts to land use
- Employment and procurement opportunities
- Impacts on livelihoods
- Revenue generation for local government and communities and local development
- Impacts on infrastructure.

12.3.1 Impact Assessment

12.3.1.1 Land Use

The total area of the Project site is about 4,750 ha. Based upon the current layout and design of Čibuk 2 the amount of land which will be occupied by Project infrastructure is around 8.75 ha. This area is less than 0.2% of the Project site. As the amount of land lost to agriculture is very small, the sensitivity of individual users of land is low. The impact will effect a small number of people, and although the change will be permanent, the magnitude of this impact is also low. As a result, the significance of this impact is assessed as **negligible beneficial.**

12.3.1.2 Employment and Procurement Opportunities

The operational life of the Project is expected to be at least 30 years. During that time, only a small workforce will be needed, i.e. no more than 10 employees. Whilst the stability of long-term employment will have a significant beneficial effect on the lives of these individuals and their households, whose sensitivity is medium, this number is very low making the magnitude negligible and resulting in the significance of this impact being assessed as **negligible beneficial**.

Indirect employment may occur as a result of increased spending of those employed by the Developer. However as this number is very low, this is also assessed as a **negligible beneficial** impact. The procurement of local goods and services is also likely to be minimal and have a **negligible** impact on local economies. In both cases the receptors' sensitivity (local residents / communities) is considered medium, however the magnitude of the impacts is negligible, as they will benefit a very small number of people.

12.3.1.3 Livelihoods

During the operational phase, there is a very small chance of crops being damaged as a result of accessing WTGs for repairs or maintenance. The Developer will compensate owners of land for any damages or losses, at full replacement cost and the disturbed land will be fully reinstated, which is why the magnitude is considered low. The sensitivity of users of land who are impacted is also low, as the affected areas are expected to be very small, which is why the significance of this impact is assessed as being **negligible adverse**.

12.3.1.4 Revenue Generation for Local Government and Communities and Local Development

The municipality Kovin is the recipient of local fees and taxes being paid by the Project (i.e. Čibuk 1 and Čibuk 2) and a significant additional benefit is expected from property tax revenues. This tax will be paid once the construction of Čibuk 2 and associated infrastructure has been completed.

In addition, the municipality is already benefitting both from a share in the Project's net profit and donations directly supporting local communities and organisations. If analysing only the benefit from the profit-sharing agreement, for the year 2021, the amount which will be invested locally represents over 3% of the municipal budget. This does not include the direct financial contribution from property tax or the amounts invested directly into local projects and initiatives. Also, the share in the local budget will hopefully grow as the profit from the Project increases.

All these combined contributions to the local budget will have significant benefits for the local population. The use of these financial contributions is monitored by WEBG as the money must be allocated to specified project that have been agreed by WEBG. This will enable the municipalities to make additional important investments and improve the delivery of certain services to citizens, particularly in terms of infrastructure improvements. With all this in mind, the magnitude is considered to be medium. Due to the importance of budget revenues for underdeveloped municipalities such as Kovin, its sensitivity is also considered to be medium and therefore the impact is assessed as **moderate beneficial**.

12.3.1.5 Infrastructure

The Developer will carry out regular maintenance of upgraded tracks needed to access wind turbines for repairs and maintenance. The volume of these works is considered low. The sensitivity of local users of land is considered to be medium, and the significance of the impact is assessed as being **minor beneficial**.

12.3.2 Impacts Summary

The most significant socio-economic impact during the operation phase is in relation to revenue generation for the municipality and donor support for local initiatives and is assessed as being a moderate beneficial impact.

Minor beneficial impacts are expected as a result of regular maintenance of access tracks used by local owners of land. All other impacts such as land available for use again, employment and procurement opportunities, as well as any impacts on livelihoods, are negligible. The positive impacts are mostly long term and all impacts are of a local character.

12.3.3 Proposed Mitigation/ Control Measure

12.3.3.1 Land Use

Maximise the amount of land which can be used again and fully restore all previously used land to its original condition.

12.3.3.2 Employment and Procurement Opportunities

As for construction related employment, the contracting of any individuals for the operation of the WPP will follow principles of international best practice. To foster the creation of indirect employment opportunities, the Project will continue to procure goods and services locally whenever possible.

If the above measures are implemented, more local people will be employed and more goods procured locally, enhancing the positive impact.

12.3.3.3 Livelihoods

Economic displacement of persons whose crops may be affected by repairs will be mitigated by undertaking the following measures:

- Minimise the amount of land occupied or disrupted during repairs;
- compensate all users of land for lost crops and any other damages at full replacement value;
- fully reinstate the land after disruption;
- implement a grievance mechanism.

If the above measures are implemented, it is expected that no one will be economically displaced by the project.

12.3.3.4 Revenue Generation for the Local Government and Communities and Local Development

Ensure that all payments of fees and taxes, as well as donor support payments (as Social Investment), are made in a timely and transparent manner. Contributions into the municipal budget will provide some stability in the long term and will enable the municipalities to make more significant investments for the benefit of local residents.

12.3.3.5 Infrastructure

Regular maintenance of access tracks will be carried out to contribute to improved access to land plots and this will maintain the positive relationship with local owners of land.

12.3.4 Conclusions

A summary of socio-economic impacts during the operational period is provided in the tables below.

Impact or Opportunity:	Land rehabilitated and available for use to individual users (low sensitive receptors).		Ref. No.:	31
Characteristics of the Impact or Opportunity:	Positive/ ~~Negative~~ Direct/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ ~~Long-term~~/ Permanent Local/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Maximise the amount of land which can be used again, fully restore all previously used land to its original condition.			
Residual Impact:	Limited land will be available for use in the same way as before the project.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	No Change	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 12-6 Land Rehabilitated and Available for Use

Impact or Opportunity:	Employment opportunities for local residents (medium sensitive receptors).		Ref. No.:	32
Characteristics of the Impact or Opportunity:	Positive/ ~~Negative~~ Direct/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ Long-term/ ~~Permanent~~ Local/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	As for construction related employment, the contracting of any individuals for the operation of the WPP will follow principles of international best practice.			
Residual Impact:	More local people are employed than originally anticipated.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	No Change	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 12-7 Employment Opportunities during Operation

Impact or Opportunity:	Procurement opportunities for local companies (medium sensitive receptors).	Ref. No.:	33
Characteristics of the Impact or Opportunity:	Positive/ ~~Negative~~ Direct/ ~~Indirect~~ ~~Temporary~~/ Short-term/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ Local/ National/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	To foster the creation of indirect employment opportunities, the Project will continue to procure goods and services locally whenever possible.		

Residual Impact:	More goods are procured locally than originally anticipated.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	No Change	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 12-8 Procurement Opportunities during Operation

Impact or Opportunity:	Involuntary economic displacement of users of land as a result of damages/loss of crops (low sensitive receptors).		Ref. No.:	34
Characteristics of the Impact or Opportunity:	~~Positive~~/ Negative Direct/ ~~Indirect~~ Temporary/ ~~Short-term~~/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ Local/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Minimise the amount disrupted land and damages; Compensate all users of land for lost trees and any other damages at full replacement cost; Fully reinstate the land after disruption; Establish and implement a grievance mechanism.			
Residual Impact:	No one will be economically displaced by the project.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	No Change	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 12-9 Involuntary Economic Displacement of Users of Land

Impact or Opportunity:	Revenue generation for local government and communities (medium sensitive receptor).		Ref. No.:	35
Characteristics of the Impact or Opportunity:	Positive/ ~~Negative~~ Direct/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ Long-term/ ~~Permanent~~ Local/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Ensure that all payments are made in a timely and transparent manner.			
Residual Impact:	Contributions into the municipal budget and direct investments will provide stability in the long term and will enable the municipality to make more significant investments for the benefit of local residents.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	No Change	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 12-10 Revenue Generation for Local Government and Communities

Impact or Opportunity:	Regular maintenance of access tracks to enhance land use by local land owners (medium sensitive receptors).	Ref. No.:	36

Characteristics of the Impact or Opportunity:	Positive/ ~~Negative~~ Direct/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ Long-term/ ~~Permanent~~ Local/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Regular maintenance of access tracks.		
Residual Impact:	Improved land use for local land owners, leading to maintained positive relationships with the local population.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	No Change	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 12-11 Maintenance of Access Tracks

12.4 Landscape and Visual

Development of the Čibuk 2 WPP would introduce up to 25 additional large vertical features into the landscape which already includes 57 wind turbines of the Čibuk 1 WPP. The Čibuk 2 turbines would be significantly larger: 151m to the hub compared to 110m of the Čibuk 1 and 240m to the blade tip compared to 170m of the Čibuk 1. Blade rotation of both WPPs would be similar and slow. Turbine colour would be similar – light grey.

12.4.1 Mitigation by Design

Key mitigation of landscape and visual effects is an integral part of the project design as potential for mitigation (turbine relocation, screening features) would be rather limited in the later stages of the project.

The project layout that is the subject of this LVIA, already incorporates the landscape and visual design considerations for good WPP design. This assessment is therefore an assessment of the residual impacts of a design.

The primary mitigation measures incorporated in the Čibuk 2 WPP design are the following:

- While formally an extension of Čibuk 1, the Čibuk 2 would be a separately positioned WPP, slightly distant from the Čibuk 1. Given the difference in their turbine size, the slight separation would help maintain the Čibuk 1 and Čibuk 2 as distinct entities and would provide the balance between the two WPPs and the open landscape between them.
- The Čibuk 2 turbines have been proposed within a vast flat site surrounded by land at similar elevation which limits open views of the WPP, particularly from nearby settlements.
- All of the Čibuk 2 turbines have been located greater than 4 times the blade tip height from sensitive receptors in order to protect residential visual receptors.
- The Čibuk 2 layout has been proposed as a coherent cluster with generally consistent spacing, there are two turbine outliers slightly separated from the main group (WTGs No. 7 and No. 22).
- The proposed layout is simple and regular and follows a grid-like nature of the strip field pattern and network of existing access tracks, with the aim of minimising the extent of additional tracks and loss of agricultural land.
- The shade of white required by Serbian regulations on aircraft safety will reduce the turbine visibility when viewed against the distant landscape.
- There are no specific viewpoints in the surrounding landscape or "key views" which would potentially be effected by the visual composition of the Čibuk 2 WPP.
- It is noted that the Directorate for Civil Aircraft specify that, to ensure air traffic safety, the turbines must be marked and illuminated to make them more visible to passing aircraft. These conditions include a requirement that the nacelles are coloured white; a white light is installed on the top of the nacelle and at least 3 low intensity white lights are installed at an intermediate level at half the nacelle height.

Recommended additional mitigation for the later stages of the project is provided in the section 12.4.4 Proposed Mitigation/ Control Measures.

12.4.2 Impact Assessment

Landscape and visual effects are closely related but it is important to make a distinction between them and address the potential impacts separately. Landscape effects are related to changes to the topography, land cover, pattern and the way landscape is perceived. Visual effects relate to how people visually experience the landscape with its existing and new features, its structure, scale, and composition.

12.4.2.1 Impacts on Landscape Character

Once the Čibuk 1 turbines were constructed (in 2018), they became a dominant feature in the local landscape and made a considerable change to its character. A solely agricultural landscape became an agricultural landscape with occasional WPPs.

The subsequent addition of the Čibuk 2 turbines would make a noticeable local change in the area south-west of the Čibuk 1 but overall, it would not fundamentally change the existing landscape character. Similar to the existing Čibuk 1 turbines, the Čibuk 2 would appear as a relatively simple and logical component of the open agricultural landscape.

The Čibuk 2 wind turbines would have a direct effect on a small proportion of this landscape. The turbine foundations and crane pads, access tracks and the substation compound would remove a small amount of existing land cover. The intensively farmed agricultural fields with undefined boundaries would not be effected by loss of any landscape feature or valuable vegetation.

Čibuk 2 would appear as the south-western extension of the Čibuk 1, retaining a balance with the surrounding open landscape between them. The addition of the Čibuk 2 WTGs would increase WPP presence in areas where the Čibuk 1 has not been prominent such as eastern Mramorak, southern Dolovo and closer to Bavanište village. In these areas, the introduction of the Čibuk 2 turbines would present a high magnitude change to the landscape character. As the distance from the site increases, the landscape character would remain the same as the existing situation with the magnitude of change being minor to negligible.

Considered very locally, on the scale of the site itself and out to about two kilometres within the nearby settlements (Mramorak, Bavanište), the incremental change due to the proposed Čibuk 2 WPP would be of a high magnitude. Given the low sensitive landscape character, this would result in a **moderate adverse** impact significance.

Considering the landscape on the scale of 2 to 5km within the settlements of Dolovo, Bavanište, and Deliblato, the incremental change due to Čibuk 2 would be of a medium magnitude. Given the low sensitive landscape character, this would result in a **minor adverse** impact significance.

Considering the landscape on the wider scale of 5km kilometres and beyond (the landscape of the South Banat Region), Čibuk 2 would have a minor to negligible effect, resulting in a **minor to negligible adverse** impact significance when combined with the existing Čibuk 1 WPP.

12.4.2.2 Visual Impact Assessment

As with the assessment of effects on landscape character, the assessment of visual effects has considered the addition of the Čibuk 2 WTGs in the context of the existing Čibuk 1 WTGs, i.e. in-conjunction and in-combination visual effects of the proposed Čibuk 2 with the operational Čibuk 1 WPP.

Once the additional 25 Čibuk 2 WTGs are introduced into the landscape, it will have been more than 7 years since the initial 57 Čibuk 1 WTGs were erected. It is reasonable to expect that during that period people will habituate to the initial visual change and will get accustomed to the turbine’s existence. It may therefore be expected that the additional visual effect of the Čibuk 2 WPP would be noticed less than the initial development of the Čibuk 1 WPP. However, in the immediate area of ten times tip height (2,400m) north-west, south-west and east of the site, the introduction of the Čibuk 2 WTGs would result in significantly new visual effects compared to the existing situation.

The analysis of ZTV maps, work in the field and visualisations have suggested that significant visual impact of Čibuk 2 would be experienced by less sensitive receptors out to about 2.5km from the development site and by more sensitive receptors out to 10km. The visual assessment has therefore considered the core Study Area of 10km to focus on residential receptors, road users, people involved in recreational activity, and agricultural workers in open areas. Beyond 10km the assessment only considered views from local roads and open fields as the field work confirmed that no significant visual effects would be experienced within settlements at that distance.

A summary of the visual effects for the main receptors in the core Study Area is provided in Table 12-12. This assessment assumes that all effects are long-term, during the proposed 30-year operational life of the WPP. All visual effects are considered to be reversible, unless stated otherwise. References are made to corresponding viewpoint photomontages, provided in Appendix B.

Table 12-12 Summary of Key Visual Impacts

Type of Receptor	Sensitivity	Description of Impact	Significance of Impact
Residential properties in villages within 2.5km of the development site			
Mramorak, Dolovo, Bavanište.	High	Introduction of the Čibuk 2 WPP would increase the number and scale of turbines visible in Mramorak and Dolovo, compared to the current visibility of the Čibuk 1 WPP. While many views within the villages would be screened due to intervening buildings or vegetation, the Čibuk 2 turbines would be prominent and large in scale in the views from the western edges of Mramorak, southern edges of Dolovo, and northern edges of Bavanište and would occupy a large proportion of the views in these areas. The two WPPs would not be intervisible in Mramorak and Dolovo as they would occupy different viewing directions and would be visible only in succession. The intervisibility would be present in Bavanište where the turbines would frequently appear in combination. The addition of the Čibuk 2 WPP would result in a high scale incremental change to the views from the edges of Mramorak and Dolovo compared to the current situation where the Čibuk 1 turbines are seen in a middle-distance. It would cause a high incremental change in Bavanište where the Čibuk 1 is not that noticeable due to the distance involved (10km). The geographical extent would be medium as the visibility would be limited to the edges of the settlements. The overall magnitude of visual change would be high to medium, resulting in **major to moderate** adverse effect on the receptors. Refer to Photomontage B1, B2, B4 (Appendix B).	Major to Moderate adverse
Residential properties in villages between 2.5km and 5km of the development site			
Dolovo, Bavanište, Deliblato	High	Within Dolovo village, when views are not screened by intervening vegetation or buildings, the Čibuk 2 will be seen in a middle-distance horizon. There would be fewer turbines of the Čibuk 2 compared to the Čibuk 1 which currently occupies the large portion of easterly views from the village. This would result in a medium to low magnitude of incremental change to the views compared to the existing situation. Taking account of the high receptor sensitivity will result in **moderate** to **minor adverse** visual effect. Refer to Photomontage B3 (Appendix B). Many views within Bavanište village would be obstructed by intervening vegetation and buildings. The Čibuk 2 turbines would mostly be visible from the western and northern outskirts of the village. This would result in a medium magnitude of incremental change to the views compares to the existing situation when the Čibuk 1 is not prominent in the views.	Moderate to Minor adverse

Type of Receptor	Sensitivity	Description of Impact	Significance of Impact
		Taking account of the high receptor sensitivity this will constitute **moderate** to **minor adverse** visual effect. Refer to Photomontage B4 (Appendix B). The houses on the western edge of Deliblato village would have a view of a more developed skyline with the addition of the Čibuk 2 turbines. The Čibuk 2 would occupy the westerly views and would appear more prominent than the Čibuk 1 turbines in the northerly views. This would give rise to a medium magnitude incremental effect on the western outskirts of Deliblato, resulting in **moderate** to **minor adverse** visual effect. Refer to Photomontage B5 (Appendix B). Apart from the edges of these villages, in other areas within villages the effect would be minor to negligible.	
Residential properties in towns and villages between 5 and 10km of the site			
Kovin, Gaj, Skorenovac	High	A limited number of properties would have a view of the proposed WPP, primarily on the edges of the settlements. The extent of visibility would be variable across the area due to the intervening landform, vegetation and buildings. When visible, the Čibuk 2 and Čibuk 1 turbines would appear as a compact group, with the Čibuk 2turbines slightly larger than the Čibuk 1. Turbine stacking and blade overlapping would be possible in some views. Compared to the current situation with the Čibuk 1 turbines being visible but rather low prominent, the Čibuk 2 turbines would give rise to a change of low magnitude. Refer to Photomontage B8 (Appendix B). For the settlements as a whole the effect would be minor to negligible.	Minor to negligible adverse
Local road users			
Travellers on local municipal roads connecting Dolovo, Mramorak, and Deliblato and state road No. 134 connecting Kovin, Gaj and the Deliblato Sands.	Medium	The addition of the Čibuk 2 WPP would increase the number of visible turbines from the local roads. The visual effect on users of the local roads would depend on distance. Travelling between Pančevo and Dolovo, Dolovo and Mramorak, and Mramorak and Deliblato the turbines would be clearly noticeable, although views would be filtered by the line of roadside trees, resulting in a **medium to high magnitude** of visual impact. Refer to Photomontage B1, B2, B3 (Appendix B).	Moderate to minor adverse

Type of Receptor	Sensitivity	Description of Impact	Significance of Impact
		Travelling along the road No. 134 from Kovin to Gaj and further to the Deliblato Sands, the turbines would be seen in a middle-distance as a regularly shaped group set against the skyline. The Čibuk 2 turbines would occupy the left half of the view and would appear more prominent than the existing Čibuk 1 which occupy the right half of the view. The scale of the incremental change is considered to be medium too small for travellers on these roads. The geographical extent is judged to be medium. The overall magnitude of change is medium to low and taking account of the medium sensitivity will result in **moderate to minor adverse** visual effect. Refer to Photomontages B8, B10 (Appendix B).	
Users of regional roads No. 10 and No. 14			
Travellers on route No. 10 from Pančevo to Vršac and on route No. 14 from Pančevo to Kovin.	Low	Views from the regional road No. 10 and No.14 would be fleeting due to speed of travel and intervening vegetation along the road. The Čibuk 2 WPP would appear distant from the road No. 14 and rather low prominent from the road No. 10. The scale of the incremental change is considered to be small for travellers on these roads. The geographical extent is judged to be small as it is limited due to intervening vegetation. The overall magnitude of change would be low and taking account of the low receptor sensitivity will result in **minor to negligible adverse** visual effect. Refer to Photomontage B7, B9, B11 (Appendix B).	Minor to negligible adverse
People involved in recreational activity			
Fishermen and other visitors to the Kraljevac Reservoir	Medium	Compared to the current situation where the Čibuk 1 turbines visibility is limited to blade tips, the Čibuk 2 turbines would appear as a compact group in the westerly views. However, many views from the Kraljevac area would be screened by the landform or vegetation and the turbines would be mostly visible from the higher ground areas around the reservoir. The incremental visual change of the addition of the WPP is judged to be medium to low scale. The geographical extent is judged to be small. The overall magnitude of change would be medium to low. Given the medium sensitivity of receptors, the visual effect would be **minor adverse**. Refer to Photomontage B5 (Appendix B).	Minor adverse.
People in work (agricultural, gas fields, infrastructure)			
Various people involved in agriculture, gas fields, infrastructure work, etc.	Low	The visual effect on people working in open fields would depend on distance. Within 3km of the site there would be a high magnitude visual impact and a **moderate adverse** effect. Between about 3 and 5km there would be a medium magnitude visual impact. Beyond 5km from the site, there would be a visual impact of low magnitude and thus a **minor adverse** effect. Beyond 10km from the site, the effect would become **negligible**. Refer to Photomontage B1, B7, B10 (Appendix B).	Moderate to negligible adverse

12.4.3 Impacts Summary

The large-scale, open and flat local landscape is considered appropriate to accommodate the proposed Čibuk 2 WPP. When the Čibuk 1 turbines were introduced in 2018 a solely agricultural landscape became an agricultural landscape with occasional windfarms. The subsequent addition of the Čibuk 2 turbines would not fundamentally change the existing landscape character. Similar to the existing Čibuk 1 turbines, the Čibuk 2 would appear as a relatively simple and logical component of the open agricultural landscape.

Significant effects on landscape character would occur out to about 2km where the turbines would dominate both horizontally and vertically, creating **major to moderate adverse** impact significance. As the distance from the site increases, the turbines would appear less prominent in the vast and flat landform, reducing the impact significance to **minor to negligible adverse**.

The Čibuk 2 turbines would be clearly visible and prominent in the view from a limited number of houses on the eastern edges of Mramorak, southern Dolovo, and northern Bavanište and it would constitute **major adverse** impact significance. From more distant views within a 5km radius (Dolovo, Bavanište, Deliblato) the incremental visual effect compared to the existing situation with the Čibuk 1 WPP would be medium to low adverse, resulting in a **moderate to minor adverse effect**. From more distant settlements (Kovin, Skorenovac, Gaj) the turbines would similarly be visible from houses on the edges of the settlements, but not prominent and thus not significant.

For recreational visitors to the Kraljevac Reservoir, the incremental visual change compared to the current visibility of the Čibuk 1 would be medium to low and the visual effect would be **minor adverse**.

There would be a significant adverse visual effect on travellers on the sections of municipal roads north and east of the site, particularly between Dolovo, Mramorak, and Deliblato, resulting in **moderate to minor adverse** visual effect. With the exception of these areas, the visual effect on road users would be **minor or negligible**.

Beyond about 5km from the site, workers in the open would be subject to a **negligible adverse** effect, between about 2 and 5km a minor adverse visual effect and within 2km of the site a **moderate adverse** visual effect.

12.4.4 Proposed Mitigation/ Control Measure

The primary mitigation is embedded in the design of the proposed WPP. No specific landscape enhancement measures are proposed.

Bespoke mitigation planting should be considered near a limited number of houses in eastern Mramorak, southern Dolovo, and northern Bavanište from which there would be an open view of the turbines at a distance of less than 2km. Specific consultation should be undertaken with the affected people and where possible, targeted screening by woodland planting should be considered.

Should mitigation planting be provided it should be with native species, suitably protected, maintained and monitored during medium-term establishment for a minimum of 5 years upon completion of the Čibuk 2.

Provided that mitigation planting is successfully implemented, the significant adverse landscape and visual effects will be reduced to the acceptable level - **moderate to minor adverse**.

12.4.5 Conclusions

A summary of impacts on the landscape character during operation of the WPP is provided in tables below.

Impact or Opportunity:	Impact on the landscape character (low sensitive receptor).		**Ref. No.:** 37
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Mitigation embedded in the design. No specific landscape enhancement measures are proposed.		
Residual Impact:	Significant effects in the immediate vicinity of the development site (2km), increasing the prominence and scale of turbines compared to the baseline situation. In the wider context of 5km and beyond there would be no significant effect.		
Residual Impact Rating:	~~Substantial Beneficial~~	~~No Change~~	**Negligible Adverse**

	~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~		**Minor Adverse** **Moderate Adverse** ~~Significant Adverse~~

Table 12-13 Impact on Landscape Character during Operation

Impact or Opportunity:	Impact on visual receptors (highly sensitive) in the east, north-west and south-west, within 2.5km of the site.		**Ref. No.:**	38
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Bespoke mitigation planting should be considered near a limited number of houses in the western Mramorak, southern Dolovo, and northern Bavanište from which there would be an open view of the turbines at a distance of less than 2.5km. Specific consultation should be undertaken with the affected people and where possible, targeted screening by woodland planting should be considered. Mitigation planting should be with native species, suitably protected, maintained and monitored during medium-term establishment for a minimum of 5 years upon completion of Čibuk 2.			
Residual Impact:	Targeted screening should reduce the visual impact to moderate to minor adverse.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	~~Negligible Adverse~~ **Minor Adverse** **Moderate Adverse** ~~Significant Adverse~~	

Table 12-14 Visual Impact during Operation

12.5 Shadow Flicker

12.5.1 Introduction

The term "shadow flicker" refers to the flickering effect caused when rotating wind turbine blades periodically cast shadows over neighbouring properties. The intensity of shadow flicker depends on distance and a number of environmental conditions that have to coincide for the effect to occur.

Apart from the sun shining and being at the low angle, position of the wind turbine rotor is additional circumstance that directly impacts shadow flicker occurrence. The effect is most intense when a wind turbine rotor plane is perpendicular to the line of sight between the receptor and the sun position. By default, the wind turbine rotor is always perpendicular to a current wind direction. Therefore, for each receptor, the rotor plane of the effecting wind turbine will only be perpendicular to it for a particular wind direction. For all other wind directions, the rotor will not be perpendicular to the receptor, and the shadow flicker occurrence and magnitude will be reduced.

Computer modelling programs for shadow flicker are aimed to calculate the maximum theoretical risk for the effected area and are therefore highly conservative and tend to overestimate the level of shadow flicker that would occur in reality. The models do not evaluate the flicker intensity rather calculate the number of hours irrespective of the effect being distinct or barely noticeable.

Blade or tower glint is an effect similar to shadow flicker, when the sun reflects off the turbine blade or tower at a particular distance. Modern wind turbines are painted with a matt, non-reflective finish, and glint is no longer considered to be a significant issue.

12.5.2 Potential Shadow Receptors

The Area of Influence of 1,600m around each proposed wind turbine has been established, based upon the guidelines described in Chapter 6. The extent of the area is shown on Figure 12-1.

The Area of Influence partially overlaps with Mramorak village (c. 300 properties out of 1,100 in total). Other structures which fall within the area are the Bavanište Monastery in the south-west, summer house in the south and biogas plant and crop warehouse in the north-east.

The sensitivity of receptor to shadow flicker depends on its usage and hours of occupancy. Within this assessment, permanently occupied residential houses are considered to be highly sensitive receptors. The sensitivity of periodically occupied weekend houses is considered to be medium. Structures which people use during their work (e.g. biogas plant, crop warehouse) are considered to be low sensitive receptors. Farm buildings (barns, storage sheds) are considered to be low to negligible sensitive receptors.

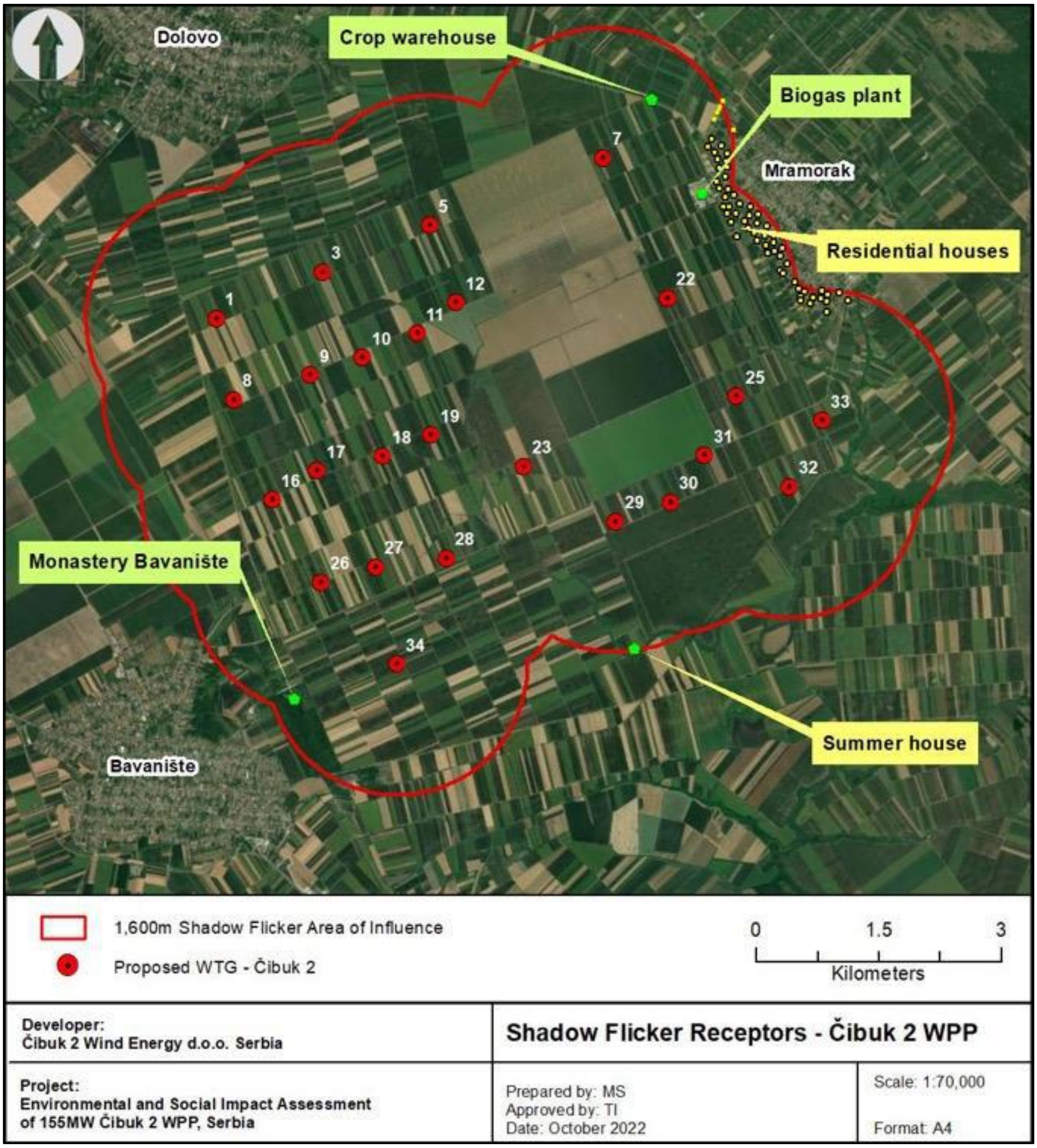


Figure 12-1 Shadow Flicker Study Area

12.5.3 Impact Assessment

This section presents the results of the worst-case scenario of shadow flicker at the identified receptors.

The worst-case scenario is a conservative prediction based on assumptions that all 25 turbines will be built, the turbines will be in continuous operation, the sun will shine every day, the turbine rotor will always be perpendicular to the window, receptors will always be occupied and will perceive the shadow flicker regardless of presence of windows or screening structures.

The recommended threshold of 30 hours per year (or 30 minutes per day, whichever is more stringent) for the worst-case scenario has been widely accepted in international good practice.

12.5.3.1 Modelling Results

The worst-case predicted hours of shadow flicker are illustrated on Figure 12-2. Isolines indicate the number of shadow flicker hours per year that would occur.

The calculations indicate that the respective threshold value would be exceeded within a limited area on the outskirts of Mramorak village, immediately east of the WPP site.

The biogas plant area would be partially affected while the other receptors including the Bavanište Monastery would not be affected.

The complete results of the predicted shadow flicker are provided in Appendix E Worst Case Shadow Flicker.

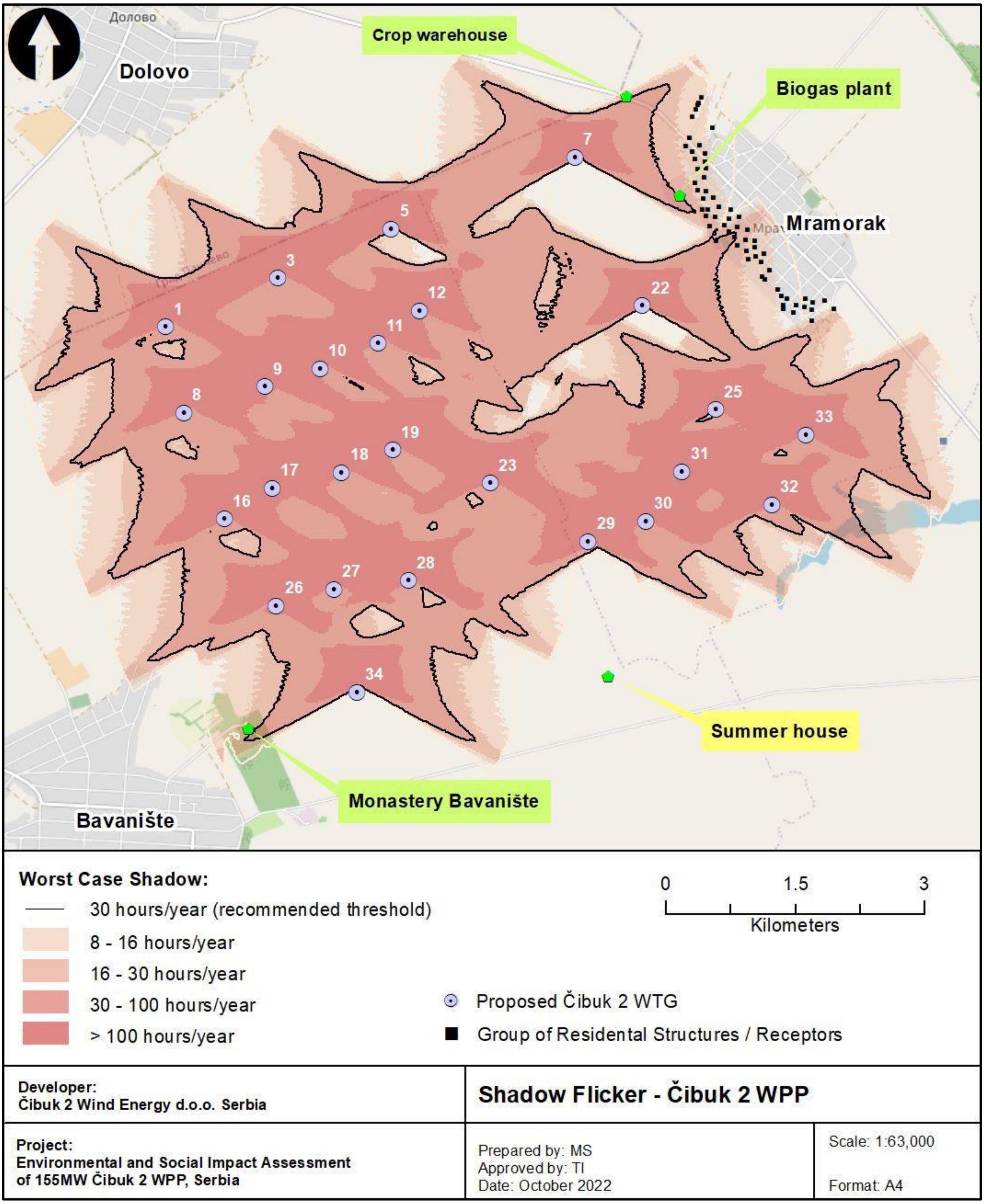


Figure 12-2 Shadow Flicker Model for Čibuk 2

12.5.3.2 Affected Receptors in Mramorak Village

The residential receptors in Mramorak which are predicted to be affected are listed in Table 12-15. There are 4 permanently occupied houses in the area where the shadow flicker is predicted to exceed the annual threshold of 30 hours. Additionally, there are 4 permanently occupied houses in the area where the amount of shadow flicker is predicted to excess the daily threshold of 30 minutes. The affected area in Mramorak is shown on Figure 12-3.

The residential houses would be exposed to the flickering effect from the proposed WTG No. 22. The effect will have a strong seasonal character, occurring from November to February between 3 and 4pm.

The assessment was based on a conservative estimate and no account was taken of typically less sunlight in winter months and existing screening features. It is therefore considered that the actual amount of shadow flickering is likely to be much less.

No.	Receptor	Coordinates UTM N 34		Worst Case Shadow Flicker	
		Easting	Northing	[hours/annum]	[min/day]
1.	Residential house (No. 1)	497,074	4,969,435	35:10	0:36
2.	Residential house (No. 2)	497,090	4,969,405	40:01	0:36
3.	Residential house (No. 3)	497,271	4,969,511	31:29	0:31
4.	Residential house (No. 4)	497,289	4,969,482	31:23	0:30
5.	Residential house (No. 5)	497,217	4,969,541	27:03	0:31
6.	Residential house (No. 6)	497,281	4,969,406	26:31	0:31
7.	Residential house (No. 7)	497,282	4,969,363	23:33	0:31
8.	Residential house (No. 8)	497,318	4,969,386	22:06	0:31

Table 12-15 List of Affected Shadow Flicker Receptors in Mramorak

The aerial image of the predicted shadow flicker zone of influence is shown on Figure 12-3.

Figure 12-3 Receptors Predicted to be Affected by Shadow Flicker in Mramorak Village
(aerial image date: 25 October 2021)

Permanently occupied houses are considered to be a high sensitive receptor, therefore the shadow flicker impact is **significant**.

The residential properties No. 3 and No. 4 in Mramorak which are predicted to experience shadow flicker are shown on Figure 12-4.

Figure 12-4 Receptors of Shadow Flicker in Mramorak (No. 4 – left, No. 3 – right)

During the visit of the area it was observed that the houses have window blinds.

The Monastery of Bavanište will not experience the shadow flicker above the threshold values (the predicted values are 28 minutes per day and 21 hours per annum).

The area of the biogas plant will experience the flickering effect of 30 minutes per day (27 hours per annum), the crop warehouse will be affected by 37 minutes per day (24 hours per annum) and a small barn (labelled 'AG' in Appendix E) will be affected by 31 minutes per day. The sensitivity of industrial structures where people work is considered to be low and the shadow flicker impact is **not significant**.

12.5.4 Impacts Summary

The shadow flicker assessment conducted for the proposed 25 WTGs indicated the potential for the effect to exceed the recommended worst-case threshold of 30 hours per annum at 4 permanently occupied houses and the threshold of 30 minutes per day at additional 4 permanently occupied houses, all in Mramorak village, immediately east of the site. The effect would occur in winter afternoons. Additionally, 4 residential houses in northern Mramorak are predicted to be affected by the cumulative shadow flicker from the Čibuk 2, Čibuk 1, and Vetrozelena WPPs.

The remaining effected properties are 4 storage sheds, the biogas plant, crop warehouse and barn.

The assessment was based on a conservative estimate and no account was taken of typically less sunlight in winter months and existing screening features. It is therefore considered that the actual amount of shadow flickering is likely to be much less.

For the affected permanently occupied houses (highly sensitive receptor) the **shadow flicker impact is considered to be significant – moderate adverse effect**.

For the affected industrial and agricultural buildings as receptors of low to negligible sensitivity, **the impact is not considered to be significant – negligible adverse**.

12.5.5 Proposed Mitigation/ Control Measure

To mitigate the effects of shadow flicker a number of mitigation options are available. There is no universal solution applicable to all receptors and some measures would be possible only with cooperation of the affected people. However, all mitigation measures can be applied or adjusted at the WPP operational phase.

The shadow flicker impact should be managed by the implementation of the following measures:

- Provide information to people in the affected area that there is a potential for shadow flicker at their properties, and provide details on the timing and duration of the effect;

- Develop and implement a Shadow Flicker Management Plan that should set out a procedure for addressing a complaint received from a receptor in the affected area. The procedure should define how the shadow flicker occurrence should be verified and what mitigation measures will be undertaken in response;
- Liaise with the Vetrozelena WPP to address potential complaints from affected receptors of the cumulative shadow flicker;
- Mitigation measures that assume cooperation of the affected people should include installation of screening structures and planting of vegetative buffers. If these measures prove to be effective, the shutting down of turbines should not be required;
- Installation of screening structures on the affected houses (e.g. blinds, window shades, window tinting) should be considered;
- Planting of vegetative buffers (e.g. trees and shrubs) as a barrier between the wind turbine and the affected window is another option. To be effective, the planting should be relatively close to the affected window which in certain cases might obstruct the view and might not be acceptable to all affected people. Another potential disadvantage is that screening via planting may take some time to establish;
- Ultimately, in the unlikely event that there is extreme nuisance or no cooperation of the affected people, individual turbines should be fitted with devices to shut down automatically when the conditions are right for shadow flicker to occur at the affected receptor;
- Effectiveness of implemented shadow flicker control measures should be monitored.

Provided that any potential shadow flicker effects can be mitigated through the implementation of the Shadow Flicker Management Plan, no significant residual effects are predicted during the operation of Čibuk 2.

12.5.6 Conclusions

Table 12-16 provides a summary of effects of the shadow flicker resulting from the proposed WPP.

Table 12-16 Shadow Flicker Impact

<table>
<tr><td>Impact or Opportunity:</td><td colspan="2">Shadow flicker effects at 8 permanently occupied houses (high sensitive) in the western Mramorak. Cumulative shadow flicker with the Čibuk 1 and Vetrozelena WPP at additional 4 permanently occupied houses in the northern Mramorak.</td><td>Ref. No.:</td><td>39</td></tr>
<tr><td>Characteristics of the Impact or Opportunity:</td><td colspan="4">~~Positive~~/ Negative
Direct/ ~~Indirect~~
~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ Long-term/ ~~Permanent~~
Local/ ~~National~~/ ~~Regional~~</td></tr>
<tr><td>Impact Mitigation or Opportunity Enhancement:</td><td colspan="4">Develop and implement a Shadow Flicker Mitigation Plan that should include:
• Provision of information to effected people on timing and duration of the effect;
• Procedure for addressing a complaint received from a receptor and how the shadow flicker occurrence should be verified and mitigation defined;
• Liaison with the Vetrozelena WPP to address potential complaints from affected receptors of cumulative shadow flicker;
• Mitigation measures (installation of screening structures or planting of vegetative buffers);
• Monitoring of mitigation effectiveness;
• Shut-down of individual turbines if measures prove to be ineffective.</td></tr>
<tr><td>Residual Impact:</td><td colspan="4">The residual shadow flicker should not exceed the recommended thresholds.</td></tr>
<tr><td>Residual Impact Rating:</td><td>~~Substantial Beneficial~~
~~Moderate Beneficial~~
~~Minor Beneficial~~
~~Negligible Beneficial~~</td><td>~~No Change~~</td><td colspan="2">Negligible Adverse
~~Minor Adverse~~
~~Moderate Adverse~~
~~Significant Adverse~~</td></tr>
</table>

12.6 Operational Noise

12.6.1 Introduction

Whilst wind turbines are a source of audible sound and infrasound, they are not noisy in absolute terms. It is possible to stand at the base of a turbine tower and hold a normal conversation. If turbines are placed near to where people live, the wind turbine sound can potentially be loud enough to be a source of disturbance.

Noise from wind turbines comprises aerodynamic noise from the turbine blades turning in the wind and mechanical noise from the gearbox and the generator. Over the years, turbine manufacturers have succeeded in substantially reducing the mechanical noise sources. Aerodynamic noise is characterised as a broadband sound not unlike wind blowing through trees, but modulated, it appears as a swishing sound at regular intervals.

Wind turbines typically operate above a "cut-in" wind speed of around 3 m/s (at hub height). The noise and power output then gradually increases with rising wind speed until the rated power is reached; typically, at a wind speed of 7 – 10 m/s at 10m height. Above this, the noise levels generally flatten off and there is little or no increase in noise with wind speed as the turbine blades are pitched to shed energy and maintain constant electrical power. The turbines are shut down, typically at wind speeds above 25m/s (at hub height) to prevent damage.

Operational noise from WPPs can be assessed as a function of wind speed, against existing background noise (BGN) levels referenced to the same wind speed. A lower fixed lower limit, such as 35 dB LA90 is often applied at the lowest wind speeds. As stated above, for modern pitch-regulated turbines, there is no increase in noise above rated power. However, the background noise at residential properties will include a contribution which is related to the wind blowing through vegetation and around structures. At high wind speeds, this can be considerable and it will often mask the wind turbine noise. It is therefore at low to moderate wind speeds, that wind turbine noise is more audible and it is not necessary to assess wind turbine noise beyond a wind speed of 10 m/s at 10m height

As the distance from a WPP site increases, the wind turbine noise level decreases as a result of the spreading out of the sound energy, but also due to air absorption, which becomes significant at high frequencies. This means that although the energy across the whole frequency range is reduced, higher frequencies are reduced more than lower frequencies such that wind turbine noise is heard as a low frequency noise at large distances. This effect may also be observed with road traffic noise or natural sources, such as the sea, where higher frequency components are diminished relative to lower frequency components at long distances.

Separate noise limits are applied for day-time and for night-time as during the night the protection of external amenity becomes less important and the emphasis is on preventing sleep disturbance. Absolute noise limits and margins above background should relate to the cumulative effect of all turbines in the area contributing to the noise received at residential properties.

Even when noise limits are fixed, there is merit in assessing WPP noise by comparison with the existing BGN. The BGN is usually measured in the external amenity area of nearby Noise Sensitive Receptors ("NSRs"). Measurements are made in ten-minute intervals over a range of wind speeds.

12.6.2 Noise Limits

As a minimum, operational noise levels should be within the Serbian daytime and night-time noise limit of 55 dB L_{Aeq} and 45 dB L_{Aeq}. However, noise impacts can occur at lower levels and the ESIA process aims to identify such effects at lower thresholds. For this project, following the IFC EHS guidelines, a significant effect can be identified in relation to the background noise level as assessed using the L_{A90} parameter. While the 2007 guidelines indicate that the increase in background noise should be limited to 3dB, the 2015 Wind Energy Guidelines set a threshold of 35 dB L_{A90} for determining a more detailed assessment.

Serbian noise limits and the limits recommended in IFC Guidelines are described in detail in Appendix F of this report.

12.6.3 Noise Predictions

Predictions of wind turbine noise levels have been carried out to ensure that the proposed development can comply with the Serbian Noise Limits. The calculations have been carried out using a computer model 'IMMI', which implements the ISO 9613-2 methodology with the input parameters from the IoA GPG, as follows:

- Downwind propagation in respect of all turbines and other WPPs;
- Turbine sound power levels include a +2dB allowance for uncertainty;

- An assumption of 'Mixed ground' (G=0.5, that is neither wholly absorptive or reflective) is set to calculate the ground effect (Agr) with a receiver height of 4m;
- Air absorption calculated using a temperature of 10°C and 70% relative humidity;
- Screening losses are limited to a maximum value of 2dB with the source modelled at the tip height of turbines – in this case 200m.

For this project, a GE Cypress 6.1-158 wind turbine has been identified as a suitable candidate turbine with a potential hub height of 151m. The stated sound power is shown below for the standard operating mode (Mode 0) with a 2.1 dB factor added for uncertainty derived in accordance with technical specification IEC 61400-14[36].

The turbine is also available with a large number of reduced noise modes. However, the use of these noise reduction modes results in a corresponding loss in electrical generation.

Table 12-17 Candidate Turbines Sound Power Levels dB L_{WA} including uncertainty

Turbine	Sound Power Levels dB L_{WA} at Wind Speeds (m/s) at 10m Height							
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s
GE Cypress 6.1-158	96.3	99.9	104.7	108.4	109.1	109.1	109.1	109.1

It can be seen that the Candidate turbine has a maximum sound power level of 109.1 dB between 7m/s and 10m/s at 10m height. Above this wind speed, there is no increase in noise as the turbine blades are pitched to reduce energy maintain a constant rotational speed.

The noise predictions have included the effect of the existing Čibuk 1 scheme which are GE 120 2.75MW turbines with a hub height of 110m. These have been modelled using a sound power level of 108 dB L_{WA}, including uncertainty.

For the ISO 9613-2 calculation, frequency information in terms of octave band sound power values is required. These are also provided by the manufacturer as set out in the table below for the maximum sound power level for the existing and proposed wind turbines.

Table 12-18 Octave Band Sound Power Levels dB L_{WA} including uncertainty

Turbine	Sound Power Levels dB L_{WA} in Octave Band Centre Frequencies, Hertz (Hz)						
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz
GE Cypress 6.1-158 (Čibuk 2)	90.3	95.5	100.0	102.5	104.5	102.4	94.9
GE 120 2.75MW (Čibuk 1)	86.8	96	100.5	102.6	102.7	99.7	91.2

For commercial reasons, it is not possible to state which turbine will definitely be used. The other potential Candidate turbines listed in Table 5-2 have similar noise levels such that the outcome of the assessment does not depend significantly on the turbine selection. The final choice of turbine will depend on many factors, including the noise output. The options will be studied carefully by the developer and supplier when the turbines are procured and the selected unit will be compliant with the Serbian noise limits. In addition, a tonal warranty should be obtained to ensure that the turbines are free from tonal components which would result in a tonal penalty.

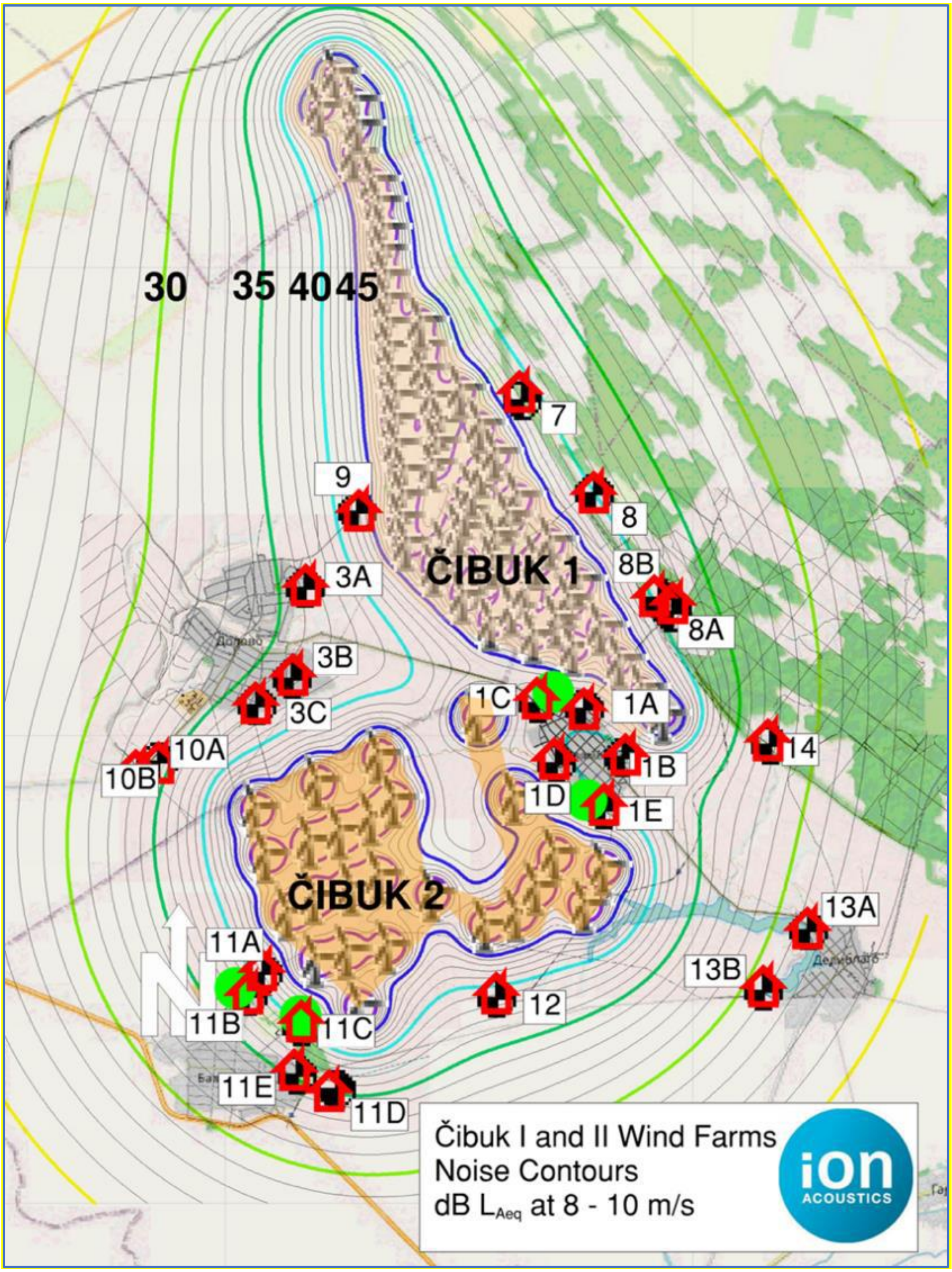
12.6.4 Impact Assessment

The noise predictions have been carried out in the first instance in the form of a noise contour plot for the Candidate turbine, and for Čibuk 1 as shown in Figure 12-5.

[36] IEC TS 61400-14:2005. Wind turbines - Part 14: Declaration of apparent sound power level and tonality values

The contour plot shows downwind noise levels at a wind speed of 7 to 10 m/s at 10m height. The Noise levels at wind speeds above 10 m/s are no higher as the turbine sound output is flat above these wind speeds.

Figure 12-5 Noise contour Plot – Candidate WTG and existing Čibuk 1



The predicted turbine noise levels at rated power referenced to wind speeds at 10m height are shown for the closest properties in Table 12-19. The predictions are set out in terms of the L_{Aeq} noise level for Čibuk 1 and Čibuk 2 separately with the cumulative level from both schemes. The L_{Aeq} levels can be compared with the Serbian noise limits. The equivalent cumulative L_{A90} value is also given for both schemes for comparison with the IFC limits set in relation to the background noise. Turbine noise measured in terms of the L_{A90} parameter is typically 2dB below the L_{Aeq} value so the L_{A90} value is simply the L_{Aeq} value less 2dB.

Table 12-19 Operational noise predictions at Receptors (dB L_{Aeq})

Location	Predicted Noise Level dB L_{Aeq} at 8 – 10 m/s			Turbine Noise Level dB L_{A90}
	Čibuk 1	Čibuk 2	Čibuk 1 & Čibuk 2	
1A	40.1	34.5	41.2	39.2
1B	37.2	35.0	39.2	37.2
1C	39.4	37.8	41.7	39.7
1D	34.6	39.9	41.0	39.0
1E	32.0	40.3	40.9	38.9
3A	35.0	30.3	36.3	34.3
3B	31.2	35.3	36.7	34.7
3C	29.0	36.0	36.8	34.8
9	42.6	27.5	42.7	40.7
8A	38.3	27.6	38.7	36.7
8B	39.0	27.5	39.3	37.3
7	41.9	23.5	41.9	39.9
8	39.9	25.5	40.1	38.1
10A	24.6	33.7	34.2	32.2
10B	23.8	32.6	33.1	31.1
11A	21.6	41.1	41.2	39.2
11B	20.8	38.0	38.1	36.1
11C	20.7	39.8	39.9	37.9
11D	19.5	35.2	35.3	33.3
11E	19.5	35.2	35.3	33.3
12	23.0	38.5	38.6	36.6
13A	22.7	27.2	28.5	26.5
13B	21.8	28.2	29.1	27.1
14	30.4	27.7	32.3	30.3

As demonstrated in the contour plots and the table above, noise levels from Čibuk 1 and Čibuk 2 are below the Serbian day and night-time limits at all locations.

12.6.4.1 Variation in Noise with Wind Speed

In addition to the overall 45 dB L_{Aeq} considered above, the locations can be assessed against the IFC limits which allow a maximum 3dB increase in the background noise. This is applied for noise levels over 35 dB L_{A90}. A noise impact of moderate significance is predicted where this noise level is exceeded (see Table 6-6).

These predictions have been made in terms of the L_{A90} index to allow comparison with the measured background noise levels. Therefore, 2dB has been subtracted from the predicted WPP noise levels (L_{Aeq}) as described above.

Note however that all locations are still subject to the maximum 45 dB L_{Aeq} night-time and 55 dB L_{Aeq} daytime Serbian Noise Limit, or in L_{A90} terms 43 dB L_{A90} and 53 dB L_{A90} for the night and daytime respectively. Therefore, any noise increase above the background has been capped at the Serbian Noise Limits.

The assessment is set out below for the nearest noise-sensitive receptor in each of the three villages. A separate prediction is made for Bavanište Monastery. The margin relative to the IFC limit is stated with a positive number indicating compliance with the limit and a negative value indicating that the predicted turbine noise level is above the IFC limit.

12.6.4.2 Noise Levels at Dolovo

The assessment is set out in Table 12-20 below. This is made for House 3C south of Dolovo which has slightly higher noise levels.

Table 12-20 Noise Assessment for Location Dolovo House 3C

Dolovo	Noise Levels (dB L_{A90}) at wind speeds (m/s) at 10m height							
	3	4	5	6	7	8	9	10
Predicted Noise Level dB LA90	22.0	25.6	30.4	34.1	34.8	34.8	34.8	34.8
Measured Daytime Background (BG) Noise dB LA90	34.2	35.2	36.4	37.6	38.8	40.2	41.6	43.1
Measured Night-time Background (BG) Noise dB LA90	34.4	34.3	34.6	35.2	36.3	37.9	40.0	42.5
Daytime threshold (35 dB LA90 or BG +3dB)	37.2	38.2	39.4	40.6	41.8	43.2	44.6	46.1
Night-time threshold (35 dB LA90 or BG +3dB)	37.4	37.3	37.6	38.2	39.3	40.9	43.0	43.0
Margin Relative to Daytime Limit	15.2	12.7	8.9	6.5	7.0	8.4	9.8	11.3
Margin Relative to Night-time Limit	15.4	11.7	7.1	4.2	4.5	6.1	8.2	8.2

It can be seen that noise levels here are compliant with the IFC limits during the day-time and night-time. During the day-time background noise levels will be sufficient to mask the turbine noise for most of the time, although turbine noise will still be audible.

House 9 which is an isolated house on the road out of Dolovo to the north-east has higher cumulative noise levels. However, noise levels at this property are determined by the existing Čibuk 1 WPP. The predicted increase due to Čibuk 2 is 0.1dB which is insignificant and negligible.

12.6.4.3 Noise Levels at Mramorak

The assessment for Mramorak is set out in Table 12-21 below. In this case house 1C has the highest noise levels, although this is partly due to noise from the existing wind turbine which has slightly higher predicted noise levels at this location.

Table 12-21 Noise Assessment for Location Mramorak House 1C

Mramorak	Noise Levels (dB L_{A90}) at wind speeds (m/s) at 10m height							
	3	4	5	6	7	8	9	10
Predicted Noise Level dB L_{A90}	26.9	30.5	35.3	39.0	39.7	39.7	39.7	39.7
Measured Daytime Background (BG) Noise dB L_{A90}	34.4	35.1	35.7	36.3	36.9	37.4	37.9	38.3
Measured Night-time Background (BG) Noise dB L_{A90}	30.6	31.4	32.0	32.5	32.9	33.1	33.1	33.0
Daytime threshold (35 dB L_{A90} or BG +3dB)	37.4	38.1	38.7	39.3	39.9	40.4	40.9	41.3
Night-time threshold (35 dB L_{A90} or BG +3dB)	35.0	35.0	35.0	35.5	35.9	36.1	36.1	36.0
Margin Relative to Daytime Limit	10.5	7.6	3.4	0.4	0.2	0.7	1.2	1.6
Margin Relative to Night-time Limit	8.1	4.5	-0.3	-3.4	-3.8	-3.6	-3.6	-3.7

Noise levels at Mramorak are within the Serbian for the daytime and night-time and IFC limits for the daytime. Cumulative noise levels just meet the IFC limit but exceed the night-time limit at wind speeds above 5 m/s. At house 1C this is mainly due to the contribution from Čibuk 1 but other locations on the south-western side of Mramorak will have similar exceedances at night where noise levels from Čibuk 2 will be higher than Čibuk 1.

It should be noted however, that the predictions for all locations in Mramorak are likely to overestimate wind turbine noise levels as it is assumed that downwind conditions apply to all turbines. In reality, Mramorak cannot be downwind of Čibuk 1 and Čibuk 2 at the same time and therefore noise levels will be less than predicted.

The nearest few turbines could operate at low noise modes to reduce noise levels at night. A preliminary assessment indicates that turbines W7, W22, W25 and W23 should operate in 103 dB mode resulting in a 4 dB reduction for those turbines, but it is proposed that any mitigation is only applied if there are complaints and if noise monitoring confirms the extent of any exceedance.

12.6.4.4 Noise Levels at Bavanište

The assessment for Bavanište is set out in Table 12-22 below. The nearest structure identified, 11A in the Table 12 14 above is not thought to be a residential location and therefore the assessment is made for house 11B close to the monitoring position.

Table 12-22 Noise Assessment for Location Bavanište House 11A

Bavanište	Noise Levels (dB L_{A90}) at wind speeds (m/s) at 10m height							
	3	4	5	6	7	8	9	10
Predicted Noise Level dB L_{A90}	23.3	26.9	31.7	35.4	36.1	36.1	36.1	36.1
Measured Daytime Background (BG) Noise dB L_{A90}	32.4	32.9	33.6	34.7	36.7	39.9	44.5	51.0
Measured Night-time Background (BG) Noise dB L_{A90}	28.1	28.8	29.8	31.2	33.0	35.2	37.7	40.5
Daytime threshold (35 dB L_{A90} or BG +3dB)	35.4	35.9	36.6	37.7	39.7	42.9	47.5	54.0
Night-time threshold (35 dB L_{A90} or BG +3dB)	35.0	35.0	35.0	35.0	36.0	38.2	40.7	43.5
Margin Relative to Daytime Limit	12.2	9.0	4.8	2.4	3.6	6.8	11.4	17.9
Margin Relative to Night-time Limit	11.7	8.1	3.3	-0.4	-0.1	2.1	4.6	7.4

Noise levels are within the Serbian for both the day-time and night-time and within the IFC limits for the daytime. There is a minor exceedance of the IFC limit during the night-time at 6 and 7 m/s, but this is less than 0.5dB and considered insignificant especially as Bavanište is to the south-west of the turbines and the prevailing wind direction will result in upwind conditions for most of the time.

12.6.4.5 Noise Levels at Bavanište Monastery

The assessment for Bavanište Monastery is set out in Table 12-23 below.

Table 12-23 Noise Assessment for Location Bavanište Monastery

Bavanište Monastery	Noise Levels (dB L_{A90}) at wind speeds (m/s) at 10m height							
	3	4	5	6	7	8	9	10
Predicted Noise Level dB L_{A90}	25.1	28.7	33.5	37.2	37.9	37.9	37.9	37.9
Measured Daytime Background (BG) Noise dB L_{A90}	32.4	32.9	33.6	34.7	36.7	39.9	44.5	51.0
Measured Night-time Background (BG) Noise dB L_{A90}	28.1	28.8	29.8	31.2	33.0	35.2	37.7	40.5
Daytime threshold (35 dB L_{A90} or BG +3dB)	35.4	35.9	36.6	37.7	39.7	42.9	47.5	54.0
Night-time threshold (35 dB L_{A90} or BG +3dB)	35.0	35.0	35.0	35.0	36.0	38.2	40.7	43.5
Margin Relative to Daytime Limit	10.4	7.2	3.0	0.6	1.8	5.0	9.6	16.1
Margin Relative to Night-time Limit	9.9	6.3	1.5	-2.2	-1.9	0.3	2.8	5.6

Noise levels are within the Serbian limits during the day-time and night-time and within the IFC day-time limits but, again, background noise levels at this location are very low at night and therefore it is not possible to meet the IFC limit which is 3dB above the background noise. Noise levels at the closest location are around 2dB over the IFC limit at 6 and 7 m/s. Nevertheless, predicted noise levels are low in absolute terms. To achieve a reduction of 2dB in the predicted noise levels, it would be necessary to run turbines operating turbines 7, 22, 25, 26, 27 and 34 in 103 dB mode during the night. The mitigation would only need to be applied during the night and then only to the wind speeds with the exceedance, that is 6 and 7 m/s at 10 m height.

12.6.5 Impacts Summary

The assessment has indicated that all locations can meet Serbian limits with Čibuk 1 and Čibuk 2 in operation. However, the nearest locations in Mramorak and Bavanište will have night-time levels over the IFC limits which are set 3dB above the background noise levels. Relatively low background noise levels occur during the night and therefore the IFC limit is fairly onerous in absolute terms.

12.6.6 Proposed Mitigation/ Control Measure

The proposed turbines can operate at low noise modes (albeit with a reduction in electrical power). Therefore, it will be possible to reduce noise levels by 3dB respectively by operating the nearest few turbines at low noise modes for the wind speeds where the exceedance is predicted. However, as the likelihood of creating a noise nuisance is low, the low noise mode will be used in the event of complaints (and subsequent confirmation of any exceedance by noise monitoring). With such a reduction, the significance impact rating would be **Minor Adverse.** The low noise modes would only need to apply during the night-time period from 22.00 to 06.00 when background noise levels are low. It is reiterated that turbine noise levels are low in absolute terms and below sleep disturbance thresholds and within Serbian noise limits. The predictions also include a margin for uncertainty. Therefore, any such reduction may not be necessary and would depend on the residents' experience and noise monitoring.

12.6.7 Conclusions

A summary of operational noise impacts is provided in Table 12-24.

Impact or Opportunity:	Increased environmental noise during operation		**Ref. No.:** 46
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct/** ~~Indirect~~ ~~Temporary/ Short-term/ Medium-term/~~ **Long-term**/ ~~Permanent~~ Local/ ~~National/ Regional~~		
Impact Mitigation or Opportunity Enhancement:	It will be possible to meet the IFC night-time noise limits by operating turbines 7, 22, 25, 26, 27 and 34 at low noise modes.		
Residual Impact:	Noise will still be audible and is classified as an impact of minor significance.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	~~Negligible Adverse~~ Minor Adverse at the nearest properties in Mramorak and Bavanište although there are multiple properties at these locations ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 12-24 Operational Noise Impact

12.7 Community Health, Safety and Security

During the operation phase, public safety and security risks relate to fire, ice throw, turbine collapse or failure, blade shear or breakage and unauthorised access.

12.7.1 Impact Assessment

12.7.1.1 Fire Risk

The wider site area consists predominantly of farm crops and the natural fire hazard is considered to be very low. Man-made fire hazard is present in the area due to the practice of stubble burning after harvest (despite being banned). After a series of traffic and ambient air quality incidents in 2018 and 2019 across the country, national and local authorities have started to enforce the ban more strictly. The remote sensing fire maps suggest a significant drop in fires after 2020.[37] However, the hazard cannot be fully excluded.

The small natural gas extraction wells at the site present fire and explosion risk. The proposed closest WTGs are more than 700m away from the wells. The proposed underground cable route does not intersect the underground gas pipelines operated by NIS. Given that NIS holds the exploration licence for the entire WPP site, opening of new oil and gas fields during the WPP operational life is possible.

To minimise the risk for the WPP infrastructure, both man-made fire hazards (stubble burning, accidents in the natural gas facilities) require liaison with relevant statutory stakeholders and consideration of potential accidents as part of the OESMP (i.e. Emergency Preparedness and Response Plan).

Mitigation by Design

The distance between the proposed WTGs and closest natural gas extraction wells is significantly larger than a setback required by law (200m from each side of the gas pipeline). As part of the Location conditions for the WPP, NIS did not have any specific technical requirements related to the WPP design or construction.

Wind turbines are designed with structural fire protection aimed to minimise the fire risk to nearby areas. The turbines are equipped with comprehensive fire detection and warning systems, integrated to SCADA:

- The operating temperature of individual components is monitored in the nacelle. If limit values are exceeded the affected systems are switched off. Remote monitoring is automatically informed of the

[37] https://firms.modaps.eosdis.nasa.gov/map/

failure of individual components and the turbine can be automatically shut down. This includes the automatic shut down if ambient temperature exceeds the safe operating range (40º C);

- The turbine design includes integrated lightning, earthing and overvoltage protection. The blades are fitted with multiple lightning receptors that conduct the lightning to the tower and safely into the ground. The electronic components within the nacelle have lightning protection.

Power generation and electrical equipment which would be present on site (wind turbines, power transformers, transmission lines) have the fire potential. Per Serbian Law on Fire Protection, large-scale WPPs are categorised as facilities in the third category of fire risk (out of three, with the first being the highest). Substations and switchyards are in the second category of fire risk.

Lightning Strikes

Lightning strikes have the potential to start a fire. Wind turbines are equipped with lightning and surge protection systems, however, insufficient grounding or a lightning strike with more than average power can start a fire. Due to the nature of the design, a very small amount of readily combustible materials is associated with the wind turbine structure. No incidents have been found where turbine fires have led to injury or property damage. The risk of turbine fire causing injury or property damage is considered to be **negligible**.

Fire Protection Infrastructure

By law, fire protection infrastructure at the site is required for the substation compound. The technical details are part of the 'Design for Building Permit' and subject to approval by the fire safety authority. It is mandatory to have an on-site source of water supply with capacity and pressure sufficient for fire suppression for 2 hours.

The Čibuk 2 substation would be constructed within the existing Čibuk 1 substation compound where the fire protection infrastructure comprises one groundwater well with sufficient capacity to supply the water tank for two hours. The fire protection infrastructure would be expanded accordingly to accommodate the Čibuk 2 substation. The 'Design for Building Permit' would have to be approved by the fire safety authority.

The existing Čibuk 1 substation is situated on a gravelled area with no surrounding vegetation to minimise the spread of fire. The power transformers are provided with concrete bunds of sufficient capacity to contain the oil in case of leakage and reduce the risk of oil catching fire. The substation compound is at a distance of more than 2.5km from a nearby residential property (in Dolovo). The risk of the Čibuk 2 transformer fire leading to injury or property damage is **negligible**.

The closest fire brigades are located in Dolovo, Bavanište and Pančevo having a response time of between 10 and 25 minutes.

12.7.1.2 Ice Throw

In terms of susceptibility to icing, South Banat and the Čibuk 2 WPP site are rated in the lowest class of risk of ice accumulation (IEA Ice Class 1). Ice build-up on equipment and instruments in the Class 1 regions is between 0 and 1.5% of the year (up to 7 days per year). In the Class 1 regions annual number of ice pieces (heavier than 50g) per wind turbine is estimated to up to 200. For context, sites prone to icing generate 2,000-8,000 ice pieces per turbine.[38]

The modern turbines are equipped with standard vibration sensors as part of their design to detect imbalances on the turbine blades, which amongst other causes, can indicate ice build-up. This may lead to shut down of the turbines and therefore prevention of ice throw.

It is unlikely that during cold periods the agricultural fields will be occupied. Land owners will be made aware of the risk of ice throw/fall during the winter months and signs will be erected to warn of the potential risk during winter months.

The IFC EHS Guidelines for Wind Energy (2015) suggest that a general zone of likely ice throw is calculated by multiplying the sum of rotor diameter and hub height by 1.5. For the preferred turbine model (GE Cypress 6.1-158) it would be:

$$1.5 * (158m + 160m) = 477m.$$[38]

This is a conservative approach which distributes the ice throw risk 360 degrees uniformly around each WTG and does not take into account the topography, wind direction or wind speed. The ice throw hazard area extends in a direction normal to the prevailing wind direction and downwind from the turbine.

[38] Wind Energy Projects in Cold Climates – IEA Wind, 2011

The closest residential properties are situated more than 1.1km from the nearest turbine and are not within the ice throw risk zone.

Workers attending the site during cold conditions, including “NIS” workers in the gas fields and workers of the agricultural company ‘Zlatar’, should be aware of the potential hazards associated with ice build-up on the turbine structures. Where there is a potential risk of ice throw/fall, work associated with the turbine structures should be prohibited. A safety procedure should be developed and implemented to restrict access to turbine while ice remains on the turbine structure and the turbine shut-down and restarting is done only remotely.

It is considered that the risk of ice throw from ice build-up on the turbine blades leading to injury or damage is **negligible**.

12.7.1.3 Unauthorised Access

While the access to the site would not be restricted, the wind turbines would be designed to prevent unauthorised access. The substation is fenced off and locked unauthorised access is possible. Other buildings at the site are also secured.

Additional management measures should be applied so the risk of unauthorised access and vandalism is reduced to **negligible**.

12.7.1.4 Turbine Collapse or Failure

Occurrences of turbine collapse are extremely rare. The turbine design would be based on the local ground conditions and the seismic setting of the area.

It is unlikely that persons will be in the vicinity of the WPP during conditions which may lead to turbine collapse and the distance of 1,100m to the nearest residential property will eliminate any risk. Based on the above information we have determined that the potential risk of turbine collapse leading to injury or property damage is considered to be **negligible** and is not assessed further.

12.7.1.5 Blade Shear or Breakage

The turbines would be designed in accordance with all relevant industry standards and guidelines and would be appropriate for the environmental conditions and wind regime in the Čibuk 2 area.

The turbines would be subject to a routine programme of inspection and maintenance based on industry best-practice and the turbine manufacturer’s guidance and recommendations throughout their operating life.

Blade shear or breakage is a rare occurrence and injury as a result of blade shear or breakage is rarer still. It is unlikely that persons will be in the vicinity of the WPP during conditions which may lead to blade shear/breakage and distance of 1,100m to the nearest residential property will minimise any risk. The potential risk of blade shear or breakage leading to injury or property damage is considered to be negligible and is not assessed further.

The risks of public injury or damage due to very low probability events such as blade shear/breakage or turbine collapse are considered to be **negligible**.

12.7.2 Impacts Summary

Man-made fire hazards at the site are related to the nearby commercial gas extraction wells and stubble burning accidents. To minimise the risk, the Čibuk 2 WPP must liaise with relevant statutory stakeholders and consider the potential fire and explosion accidents as part of the OESMP (i.e. Emergency Preparedness and Response Plan).

The Čibuk 2 substation which would be situated within the Čibuk 1 substation compound is at a distance of more than 2.5km from a nearby residential property (in Dolovo). The risk of a power transformer fire accident leading to injury or property damage is negligible.

Due to the nature of the design, a very small amount of readily combustible materials is associated with the wind turbine structure. The risk of turbine fire causing injury or property damage is considered to be negligible.

The Čibuk 2 area is not susceptible to icing. A sufficient setback distance would be established around the proposed WTGs to eliminate the risk of blade ice throw leading to injury or damage in the local community.

The wind turbines and substation compound will be designed to prevent unauthorised access. Additional management measures would be needed to minimise the risk of vandalism.

It is unlikely that persons will be in the vicinity of the WPP during conditions which may lead to blade shear/ breakage and distance of 1,100m to the nearest residential property will minimise any risk.

12.7.3 Proposed Mitigation/ Control Measure

12.7.3.1 Fire Risks

An Operation Emergency Preparedness and Response Plan should be developed prior to commencement of the WPP operation. The nearby fire brigades should be consulted for the Plan development. The framework for the Plan should include but not be limited to:

- Wind turbine fire response procedure including actions to be taken by the WPP personnel, informing the fire brigade, health and safety protocols;
- The WPP operation protocols during fire (remote shut down of turbines, position and pitch of blades, evacuation from the site, etc.);
- Fire or explosion response procedure in case of an accident at the natural gas wells;
- Monitoring of stubble burning incidents in the area during harvest season and reporting to the nearby fire brigade.

Provided that the fire preparedness and response measures are implemented, there should be no risk of fire leading to injury or property damage.

12.7.3.2 Ice Throw

- Warning signs in respect to ice throw risks should be posted at the entrance to the site;
- Working procedures should be developed and implemented to ensure the safe work in icing conditions, including the turbine shut down before maintenance.
- Operational communication with “NIS” and ‘Zlatar’ should be established to ensure safe working conditions for “NIS” and ‘Zlatar’ workers attending the WPP site in icing conditions.

In case that the control measures are implemented there should be no risk of ice throw injury or damage.

12.7.3.3 Unauthorised Access

In addition to security measures implemented by design (turbines designed to prevent unauthorised access, fenced off substation), management measures should be in place to eliminate the risk for the onsite staff and infrastructure:

- Each turbine access door should be locked;
- Access to turbine tower ladders should be prevented;
- The substation should be fenced off and locked; and
- Signposts should be erected detailing the potential dangers of unauthorised access.

Provided that the technical and management measures to prevent unauthorised access are applied, the risk of vandalism and injury should be negligible.

12.7.4 Conclusions

A summary of potential community health, safety and security risks during the WPP operations is provided in tables below.

Impact or Opportunity:	Damage of the WPP infrastructure due to fire or spreading of fire from the WPP infrastructure to nearby areas.	**Ref. No.:**	47
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		

Impact Mitigation or Opportunity Enhancement:	An Operation Emergency Preparedness and Response Plan should be developed prior to commencement of the WPP operation. The nearby fire brigades and the operator of the commercial gas fields "NIS" should be consulted for the Plan development. The framework for the Plan should include but not be limited to: • Wind turbine fire response procedure including actions to be taken by the WPP personnel, informing the fire brigade, health and safety protocols; • The WPP operation protocols during fire (remote shut down of turbines, position and pitch of blades, evacuation from the site, etc.); • Fire or explosion response procedure in case of an accident at the natural gas wells; • Monitoring of stubble burning incidents in the area during harvest season and reporting to the nearby fire brigade.		
Residual Impact:	The risk of fire should be negligible.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 12-25 Fire and Wildfire Risk during Operation

Impact or Opportunity:	Ice throw-related safety risks to local residents and workers (high sensitive receptor).		**Ref. No.:**	48
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Warning signs in respect to ice throw risks should be posted at the entrance to the site; Working procedures should be developed and implemented to ensure the safe work in icing conditions, including the turbine shut down before maintenance; Operational communication with "NIS" and 'Zlatar' should be established to ensure safe working conditions for their workers attending the WPP site in icing conditions.			
Residual Impact:	The risk of ice throw-related injury or damage should be negligible.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 12-26 Ice Throw Risks

Impact or Opportunity:	Unauthorised access of local residents (highly sensitive receptor) during the operation phase.		**Ref. No.:**	49
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Each turbine access door should be locked; Access to turbine tower ladders should be prevented; The substation should be fenced off and locked; and Signposts should be erected detailing the potential dangers of unauthorised access.			
Residual Impact:	The risk of vandalism or injury due to unauthorized access should be negligible.			
Residual Impact Rating:	~~Substantial Beneficial~~	**No Change**	~~Negligible Adverse~~	

	~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~		~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 12-27 Unauthorised Access Risks during Operation

12.8 Traffic and Transport

Once operational, the amount of traffic associated with the Čibuk 2 WPP would be minimal, limited to occasional maintenance works. The number of permanent staff at the site would be very low and they would be situated within the Čibuk 1 control room.

12.8.1 Impact Assessment

The service and maintenance trips to the site would predominantly include light vehicles for routine maintenance, safety checks and repair, visiting the site a couple of times per month.

Heavy good vehicles and access cranes for heavier maintenance and repairs would be occasionally needed. Due to a low number of HGV trips, the local road network or baseline traffic flows are not expected to be affected. The maintenance works are not likely to disrupt the access to the agricultural plots.

Access to the site of heavy vehicles would be provided via the established access roads.

The annual average daily traffic on local roads is medium to low and their sensitivity to congestion is considered to be low. The occasional traffic of heavy vehicles would present an effect of a low magnitude resulting in **negligible adverse** impact.

12.8.2 Impacts Summary

The impact of maintenance and repair vehicles during the operation phase is not considered to be significant.

12.8.3 Proposed Mitigation/ Control Measure

As the level of vehicle movement is so small it is not considered appropriate to adopt a Transport Management Plan for the operation phase.

As long as appropriate established routes are used and management measures are implemented, the residual impact during the operational phase is considered to be negligible adverse.

12.8.4 Conclusions

The impact of maintenance and repair vehicles during the operation phase is not considered to be significant.

As the level of vehicle movement is so small it is not considered appropriate to adopt a Transport Management Plan for the operation phase.

12.9 Environmental Pollution

During the operational phase, it will be necessary to provide facilities, equipment and management controls to protect land quality, groundwater, and surface water from sources of pollution. These sources of pollution will originate from the maintenance of the WTGs and electricity transformers. These maintenance activities will:

- Create limited volumes of hazardous and non-hazardous waste.
- Require the storage and handling of hazardous materials including oils, greases and aerosols (e.g. spray lubricant).
- Generate small quantities of domestic wastewater from staff welfare facilities.

It is therefore necessary to protect the soil, groundwater and surface water from pollution that could occur from the accidental release of hazardous materials or hazardous waste and the release of domestic wastewater from the septic tanks.

The construction of the WTG foundations, maintenance pads and access tracks could change local surface run-off patterns.

12.9.1 Impact Assessment

The hazardous waste that will be generated during WPP maintenance includes waste oil (hydraulic, lubricating, transformer oil), cooling fluids, contaminated absorbents (rags), waste electric and electronic equipment, batteries, and waste packaging containing residues of contaminating materials.

The regular operation of the Čibuk 2 WPP would not generate significant waste volumes, measured in kilogrammes per year rather than tonnes. The largest volumes of waste will be generated during the periodic maintenance of WTGs, such as the change of gearbox oil, or major equipment failure. Under Serbian regulations, all waste streams must be recycled or disposed to a licensed facility. Improper storage, treatment or disposal of waste generated during operations may be a source of contamination on and off the WPP site. Depending on the waste properties and volume, this may result in **moderate adverse** significance impact.

The O&M Contractor is expected to hold waste on site within a short-term, interim storage facility (closed and secured, with impermeable floor). It is likely that these wastes will be removed from site every few months due to the small quantities involved. Non-hazardous waste would comprise metal scrap, packaging waste, paper, and municipal waste. These materials will be held in containers provided by the recycling or waste disposal companies.

The hazardous materials necessary for the operation of the WPP will include:

- Insulating oil in the power transformer proposed within the substation compound. The proposed 180MVA power transformer will contain about 60 tonnes of insulating oil. By law, each power transformer must be provided with reinforced concrete bunds of sufficient capacity to contain the oil in case of leakage (at least 110% of the total volume of oil). The oil containment bunds must be sealed and must not be connected to any sewer system or septic tank. In case of an accidental release (or fire), the likelihood that the oil would not be contained in the bunds is negligible. The transformers will be maintained by a licensed contractor who would dispose of the maintenance waste.
- Gear oil, hydraulic oil, grease and transformer oil within WTGs: Maintenance technicians will monitor the levels of oil within the WTG on a regular basis and will top-up the systems as an when required. It is expected that small quantities of these oils (say 20 x 25l drums) will be held on site in a purpose-built storage facility. These drums will need to be transported to the WTGs as needed in the technicians' vans. The gearbox in each WTG holds around 500 litres of oil. Accidental leakage or release of oil in a turbine will be contained inside the tower. WTGs have sensors to detect loss in fluid and automatically shut down. The gearbox oil is normally changed every four or five years as part of the regular O&M activities. This periodic change of oil is undertaken by specialist contractors who use purpose-built tankers that hold fresh oil and the waste oil removed from the WTG.
- Diesel fuel in the backup power generator at the substation compound site. The backup power generator will be installed on a paved surface. Diesel fuel (ca. 250 litres) will be manually refilled to the generator by the WPP technicians.

The effect on soil quality (medium sensitive receptor) of a spillage of a hazardous liquid is likely to be long-term but localised, affecting the area of the release and as such is considered to be of a low magnitude. The impact significance is assessed as **minor adverse**.

Potential for contaminants to enter groundwater depends on the aquifer sensitivity and type and quantity of the released contaminant. In that respect, the shallow aquifer is underlain by a low-permeable clay layer which is considered to be low sensitive to contaminant propagation. The deep aquifer would not be affected by a potential release. Volumes of hazardous materials (oil, diesel fuel) stored at the site would be limited. Accidental release of oil or diesel fuel to the ground would affect a local subsurface area and would be an effect of a medium magnitude. The potential contamination would result in a **minor adverse** impact.

There is the potential for accidental spillage/ loss of hazardous liquids during the wind turbines maintenance. The pathway between any direct discharges from the site and drainage canals is limited – the WTGs are proposed more than 100m from the nearest canals. The risk that any releases would find their way into surface water during the operational phase of the WPP is considered to be low.

The operation of the WPP would generate relatively small volumes of process and domestic wastewater. As there is no sewerage system in the area, an internal domestic sewage network was built at the Čibuk 1 substation compound site and included a septic tank.

12.9.2 Impacts Summary

Čibuk 2 could have a potential impact on the land and groundwater quality only in case of an accidental release during maintenance activities, waste handling and storage, or sanitary wastewater leakage and release.

Potential releases of hazardous materials to the ground would be **minor adverse** impact on soil and **minor adverse** impact on the shallow groundwater aquifer.

The volume of waste generated during the operation will be small. Improper storage, treatment or disposal of waste generated during operations may be a source of contamination on and off the Project site. Depending on the waste properties and volume, this may result in **moderate adverse** significance impact.

Process and domestic wastewater effluent from the site would be routed to an internal sewage system and watertight septic tank. Potential releases of hazardous materials would be limited to accidental releases during maintenance activities. It is unlikely that there will be any direct discharges of contaminated effluent from the site to drainage canals on-site.

12.9.3 Proposed Mitigation/ Control Measure

The control measures listed in the summary tables below should form part of the ESMMP:

Provided that the control measures are implemented, residual impacts of waste generation should be **negligible**.

Provided that the control measures are implemented, there should be **no residual impact** on land and groundwater during the operation.

Provided that the mitigation measures are implemented, there should be **no residual impact** on drainage canals at the site.

12.9.4 Conclusions

A summary of potential waste generation impacts, land and groundwater impacts, and surface water impacts during the WPP operation is provided in tables below:

Impact or Opportunity:	Generation of waste during operation and maintenance activities.	**Ref. No.:**	50
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ ~~Long-term~~/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	A Waste Management Plan should be developed and implemented, incorporating hierarchy principles: reduce, reuse or recycle whenever possible; Hazardous waste should be stored in a dedicated, closed and secured area, segregated and properly labelled. Spillage protection should be provided. Per Serbian law, hazardous waste shall not be stored longer than 12 months on site; The O&M Contractor should be required to remove all waste from the turbine sites and to separate the interim waste storage facility on-site; The O&M Contractor should be required to keep and maintain waste records and to engage licensed waste transporters and treatment/disposal facilities; Compliance of the O&M Contractor with waste regulations should be periodically checked.		
Residual Impact:	Residual impact of waste generation should be negligible.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 12-28 Waste Generation during Operation

Impact or Opportunity:	Accidental releases of hazardous materials or hazardous waste to land (medium sensitive) and groundwater (low sensitive receptor) during the operation.		**Ref. No.:**	51
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	A Hazardous Material Management Plan should be prepared and implemented. Potential polluting materials (fuels, oils, chemicals) should be stored in dedicated storage areas equipped with secondary containment and other measures to retain any leakage; An Emergency Response Plan (including spill management) should be implemented, addressing any common risks or impacts, defining response, responsibilities, equipment training needs for staff at the site, etc; Spill kits should be stored at key locations on site and staff should be trained in their use; Spill kits should be available to the servicing staff during turbine maintenance. Procedural controls should be applied during draining and filling of oil in turbines; The power transformers and associated bunds should be controlled as part of the regular maintenance and inspection regime. The bund should be regularly cleaned from rainwater and other debris. If the rainwater is contaminated, it should be managed as hazardous waste by a licensed contractor.			
Residual Impact:	There should be no release of hazardous materials or waste to the ground.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 12-29 Impact of Accidental Releases of Hazardous Materials to Land and Groundwater during Operation

Impact or Opportunity:	Leakage or release of domestic wastewater from the septic tank to land (medium sensitive) and groundwater (low sensitive) receptor during the operation.		**Ref. No.:**	52
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	The septic tank should be regularly drained by a licensed contractor and disposed at an appropriately licensed disposal facility. The integrity of the sewage system and septic tank should be periodically tested (once in 5 years per law). During longer duration maintenance activities portable toilets should be provided to the service staff.			
Residual Impact:	There should be no leakage or release from the sewer system.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 12-30 Domestic Wastewater Impact to Land and Groundwater during Operation

12.10 Ecosystem Services

12.10.1 Impact Assessment

Once operational, the Čibuk 2 WPP would occupy in the long run only up to 0.5% (c. 9 ha) of agricultural land while the remaining land occupied during construction would become available again. Some crops might be damaged or lost accidentally by machinery during the maintenance works. While the crop cultivation is a priority ecosystem service and a highly sensitive receptor, the magnitude of change during the operational phase is considered to be low, resulting in an impact of **minor adverse** significance.

12.10.2 Impacts Summary

The operational phase would result in a limited disruption of a priority ecosystem service – crop production which is considered to be an impact of minor adverse significance.

12.10.3 Proposed Mitigation/ Control Measure

Mitigation measures for potential disruption of crop cultivation greatly overlap with the measures applicable to land use and livelihoods during the operation (Section 12.3 Socio-Economic Impacts during Operation).

Provided that the mitigation measures related to land use and livelihoods during the operational phase are implemented, the residual impact on ecosystem services would be reduced to **negligible adverse**.

12.10.4 Conclusions

A summary of effects related to the impact on ecosystem service during the operation of Čibuk 2 is provided in table below.

<table>
<tr><td>Impact or Opportunity:</td><td colspan="2">Disruption of crops cultivation as a priority ecosystem service (a highly sensitive receptor) during the operational period.</td><td>Ref. No.:</td><td>53</td></tr>
<tr><td>Characteristics of the Impact or Opportunity:</td><td colspan="4"><s>Positive</s>/ Negative
Direct/ <s>Indirect</s>
<s>Temporary</s>/ <s>Short-term</s>/ <s>Medium-term</s>/ Long-term/ <s>Permanent</s>
Local/ <s>National</s>/ <s>Regional</s></td></tr>
<tr><td>Impact Mitigation or Opportunity Enhancement:</td><td colspan="4">Provided that the mitigation measures related to land use and livelihoods during the operational phase are implemented, the residual impact on ecosystem services would be reduced to negligible adverse.</td></tr>
<tr><td>Residual Impact:</td><td colspan="4">Residual impact on ecosystem services should be negligible adverse.</td></tr>
<tr><td>Residual Impact Rating:</td><td><s>Substantial Beneficial</s>
<s>Moderate Beneficial</s>
<s>Minor Beneficial</s>
<s>Negligible Beneficial</s></td><td><s>No Change</s></td><td colspan="2">Negligible Adverse
<s>Minor Adverse</s>
<s>Moderate Adverse</s>
<s>Significant Adverse</s></td></tr>
</table>

Table 12-31 Impact on Ecosystem Services during Operation

12.11 Electromagnetic Interference

Within the site boundary, the proposed WTGs and associated underground cables will be a source of electromagnetic fields, in addition to the existing electricity transmission infrastructure on site (the 400kV OHL) and the substation compound.

Wind turbines blades and generators could potentially interfere with electromagnetic signals (or radio waves) transmitted as part of telecommunication systems (radio and television broadcast, mobile phones, radars, etc.). This depends on the proximity of the WTG to the signal and the path.

12.11.1 Impact Assessment

The strength of electromagnetic fields rapidly diminishes as the distance from the source is increased; at a distance of 100m the strength of the electromagnetic field is reduced to acceptable levels.

The substation and the 400kV OHL would be the most significant electromagnetic field sources within the site. The C2 substation will be more than 2,500m from the nearest residential receptor (in Mramorak village). The existing 400kV OHL runs approx. 300m from the nearest houses in Dolovo (the legal setback is 30m).

Serbian regulatory requirements for design and operation of overhead lines and substations require calculation and assessment of non-ionising radiation (electrical and magnetic fields) to be included in the design. On-site measurements of electrical and magnetic fields and their compliance with the approved design are one of prerequisites to obtain the Operation permit.

WTG electrical equipment is encased within the turbine and situated more than 100m above ground level. The closest properties are located more than 1,100m from the nearest proposed WTG. Due to the distance and shielding involved there will be **no impact on public health from electromagnetic fields**.

Wind turbines are produced in accordance with International Electrotechnical Commission (IEC) technical standards for manufacturers, and their electromagnetic compatibility is strictly measured and tested. The sensitive components are shielded to prevent them being either transmitters or receivers of electromagnetic interference. The electromagnetic disturbance from modern turbines is considered to be **negligible**.

During the statutory consultation for the Čibuk 2 WPP Zoning Plan development, state telecommunication services providers (radio and television signal) and mobile operators reported that potential electromagnetic interference with their infrastructure is not expected.

No negative impact of the proposed Čibuk 2 WPP is expected related to EM signal interference.

12.11.2 Impacts Summary

No impact on public health due to exposure to electromagnetic fields is expected given the distance to the nearby receptors. The emission of electromagnetic disturbances from the Čibuk 2 WTGs is considered to be negligible.

12.11.3 Proposed Mitigation/ Control Measure

No specific mitigation measures are proposed related to EM interference and EM fields.

There will be no residual impact on public heath from electromagnetic fields. There will be no interference with telecommunication services.

12.11.4 Conclusions

A summary of potential community health, safety and security risks during the WPP operations is provided in tables below.

<table>
<tr><td>Impact or Opportunity:</td><td colspan="2">Impact on public health of local residents (highly sensitive receptor) due to exposure to electromagnetic fields.</td><td>Ref. No.:</td><td>54</td></tr>
<tr><td>Characteristics of the Impact or Opportunity:</td><td colspan="4"><s>Positive</s>/ Negative
<s>Direct</s>/ Indirect
<s>Temporary</s>/ <s>Short-term</s>/ <s>Medium-term</s>/<s>Long-term</s>/ Permanent
Local/ <s>National</s>/ <s>Regional</s></td></tr>
<tr><td>Impact Mitigation or Opportunity Enhancement:</td><td colspan="4">Mitigation is embedded in the design.
No additional mitigation measures are proposed.</td></tr>
<tr><td>Residual Impact:</td><td colspan="4">There will be no impact of electromagnetic radiation on public health.</td></tr>
<tr><td>Residual Impact Rating:</td><td><s>Substantial Beneficial</s>
<s>Moderate Beneficial</s>
<s>Minor Beneficial</s>
<s>Negligible Beneficial</s></td><td>No Change</td><td colspan="2"><s>Negligible Adverse</s>
<s>Minor Adverse</s>
<s>Moderate Adverse</s>
<s>Significant Adverse</s></td></tr>
</table>

Table 12-32 Impacts of Electromagnetic Fields

Impact or Opportunity:	Electromagnetic interference to telecommunication signals (low sensitive receptor).	**Ref. No.:**	55

Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** ~~Direct~~/ **Indirect** ~~Temporary~~/ ~~Short-term/Medium-term~~/ ~~Long-term~~/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Mitigation is embedded in the design. No additional mitigation measures are proposed.		
Residual Impact:	The emission of electromagnetic disturbances from the Čibuk 2 WTGs will be negligible.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 12-33 Electromagnetic Interference Impacts

12.12 Aviation Safety and Radar Systems

Due to their physical size wind turbines have the potential to impact the aviation safety and the operation of radar systems.

The competent authorities in Serbia for aviation are SMATSA (air traffic control), the Directorate for Civil Aviation (air traffic safety) and the Ministry of Defence (military air traffic). The institutional stakeholder in charge for weather radars is the Republic Meteorological Institute of Serbia (RHMI).

12.12.1 Impact Assessment

During the statutory consultation for the Zoning Plan the civil aviation stakeholders confirmed that no structures for civil air traffic (radar systems, civil airports, etc.) are present within or in the proximity to the WPP site.

However, wind turbines are potential obstructions for air traffic; if not properly marked and lighted they can potentially have a significant adverse impact.

Per Serbian Law on Air Traffic, all structures higher than 100m are considered to be an obstruction for civil air traffic and as such shall be properly marked and lighted in line with the ICAO standards.

The rules for marking and lighting of turbines have been provided by the civil aviation authority for the Location Conditions and will be incorporated to the WPP design.

During the Zoning Plan development, the national meteorology stakeholder – RHMI indicated that there are two small hail suppression stations within the site boundary which use explosive flares, and required a 500m-setback to the nearest WTGs.

12.12.2 Impacts Summary

The air traffic safety regulator confirmed that **no aviation impacts** are expected from the proposed Čibuk 2 WPP, provided that the wind turbines are marked and lighted in accordance with ICAO standards and Serbian regulation.

The national meteorology stakeholder confirmed that the proposed Čibuk 2 would not interfere with weather radar systems or other meteorological infrastructure.

12.12.3 Proposed Mitigation/ Control Measure

During the development of the WPP design, the Developer provided the Civil Aviation Directorate with geographic coordinates and elevation of each proposed WTG in order to obtain the rules for marking and lighting of turbines. The Directorate issues the rules in line with the ICAO standards as part of the Location Conditions.

Provided that the turbines are adequately marked and lighted, there would be no residual impact of the Čibuk 2 WPP on aviation.

12.12.4 Conclusions

A summary of effects with regards to the aviation impacts from the proposed WPP is provided in tables below.

Impact or Opportunity:	Impact on aircraft safety (highly sensitive receptor).	**Ref. No.:**	56
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ ~~Long-term~~/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Apply legally required obstruction marking and lighting of turbines for daylight and night visibility and reduced visibility conditions.		
Residual Impact:	There should be no residual impacts on aircraft safety.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 12-34 Aviation Impacts

13 Decommissioning - Impact Assessment and Mitigations

13.1 Introduction

This Chapter describes the assessment and mitigation of the decommissioning impacts identified within the Scoping Study. The impact topics are presented in the order of significance identified by the Scoping Study. A summary of the impacts identified and recommended mitigation or control measures are presented in one or more tables at the end of each topic section. These impacts, mitigations and control measures are consolidated in a single table in Chapter 16. The Decommissioning impact summary table (see section 14.2) is linked to the Environmental and Social Monitoring and Management Plan (ESMMP) presented in Chapter 17. The ESMMP will be used as the basis of the Decommissioning Environmental and Social Management Plan (DESMP). The DESMP will include a series of subsidiary, topic specific Management Plans (see Chapter 15) that will describe the procedures and controls required to manage the impacts in line with the Project Applicable Requirements (see section 2.7).

The Scoping Study categorised the decommissioning impacts of Čibuk 2 as:

Significance Level One Issues

- Ecology and Nature Conservation;
- Landscape and Visual.

Significance Level Two Issues

- Socio-economic;
- Noise;
- Traffic and Transport.

Significance Level Three Issues

- Archaeology and Cultural Heritage;
- Surface Water and Effluent;
- Land and Groundwater;
- Air Quality;
- Ecosystem Services;
- Community Health Safety and Security.

13.2 Ecology and Nature Conservation

The impacts of the decommissioning on ecological features could be only very generally assessed at this stage as the nature and the scale of future works is not known. Generally, works during decommissioning are similar to those during the construction, and the effects would be similar to and no greater than those of the construction. Only when a plan for the future of the Project becomes available (towards the end of its operational life) will it be possible to assess sensibly the impacts of the decommissioning activities.

However, the NPC (IfNC 2021b, see Table 6 8) requires that" upon *completion of the WPP operational phase, all structures and equipment must be removed, and the site must be completely restored*". Furthermore, the same general legal obligations imposed by the Law on Nature Protection (Official Journal of RS, No. 36/2009, 88/2010, 91/2010 - correction, 14/2016, 71/2021) applied during the construction must be adopted during decommissioning. Adherence to general legal requirements, all applicable NPC (IfNC 2020, 2021a, b, see Table 6 8 and section 7.3.3.1.1), and generic GIIP during the decommissioning must be ensured through the Project Management Plans (DESMP).

Therefore, considering possible magnitude of the impact (lower that from construction), and providing that the adherence to general legal requirements, NPC, GIIP is ensured, **negligible impac**t at the most of the Project decommissioning on any ecological feature is considered highly likely.

13.3 Landscape and Visual

The future baseline is likely to include new WPP developments in the wider vicinity of the Čibuk site which would give additional wind farm character to decommissioning the existing landscape.

13.3.1 Impact Assessment

13.3.1.1 Impacts on Landscape Character and Fabric

During the decommissioning, the site would temporarily become again a "construction site" where the sequence of activities would be a reverse of the construction phase. Initially the cranes would dominate the site during the dismantling of turbine blades, nacelles and towers, and would successively be replaced by hydraulic breakers, excavators and dump trucks. This would have a short-term, reversible, **minor adverse** impact to the landscape character and fabric.

Upon completion of the decommissioning and restoration process, wind turbines and other aboveground structures would be removed. Crane pads and turbine foundations would be partially removed and the areas backfilled and restored. Access roads would most likely be left to use by local farmers. The landscape would be successfully restored to its baseline agricultural character which would result in **no change** compared to the pre-development phase.

13.3.1.2 Visual Impacts

During the decommissioning activity, the initial phase of turbine dismantling would involve large cranes that would be visible to a wider range of receptors. Later stages would only have intermittent visibility, mostly from the nearby roads. The duration of the decommissioning phase effects would be short-term and localised resulting in a low magnitude of change and a **minor adverse** impact for local residents and **negligible adverse** impact for road users.

13.3.2 Impacts Summary

The short-term effect on the landscape character would be minor adverse, but upon the site restoration, the landscape would be returned to its baseline character which would result in no change. The visual impact during the decommissioning would be minor for local residents in the close site vicinity and negligible for all other residents and local road users.

13.3.3 Proposed Mitigation/ Control Measure

Similar to the construction phase, the landscape impact mitigation measures should be the following:

- Existing vegetation should be suitable protected; land clearance/ vegetation removal should be minimised as far as possible;
- Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required;
- Stockpiling of debris should be avoided; the decommissioning site should be maintained in good condition;
- The disturbed areas should be successively restored and reinstated.

Provided that the mitigation measures are implemented, there would be no change compared to the current baseline conditions.

No specific measures are proposed to mitigate the visual effects of the decommissioning works. The residual impact would be minor adverse for local residents and negligible adverse for local road travellers.

13.3.4 Conclusions

The summary of potential landscape and visual impacts during the decommissioning phase is provided in Table 13-1 and Table 13-2.

Impact or Opportunity:	Impact on landscape character and fabric (low sensitive receptor) during decommissioning.	**Ref. No.:**	57
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~**/ Long-term**/ ~~Permanent~~		

	Local/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Existing vegetation should be suitable protected; land clearance/ vegetation removal should be minimised as far as possible; Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required; Stockpiling of debris should be avoided; the decommissioning site should be maintained in good condition; The disturbed areas should be successively restored and reinstated.		
Residual Impact:	Upon completion of the decommissioning, the site would be reverted to the pre-existing baseline condition.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-1 Impact on Landscape Character and Fabric during Decommissioning

Impact or Opportunity:	Visual impact on local residents and road users, including highly sensitive residential receptors in the north and south, during decommissioning.		**Ref. No.:**	58
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ **Direct**/ ~~Indirect~~ Temporary/ Short-term/ ~~Medium-term~~**/ ~~Long-term~~**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	No specific mitigation measures are proposed.			
Residual Impact:	Short-term and localised impact, affecting mostly the residents in the north-east and south-west and would decrease with the distance.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 13-2 Visual Impact during Decommissioning

13.4 Socio-Economic

Socio-economic impacts associated with decommissioning activities will be similar to those during the construction phase and have been grouped under the following headings:

- Impacts to land use
- Employment and procurement opportunities
- Impacts on livelihoods
- Impacts on infrastructure

13.4.1 Impact Assessment

13.4.1.1 Land Use

The dismantling of the WTGs will make less than 10 ha of land available for other use. The sensitivity of local users of land is determined as being low as a small area of land will be freed up. The magnitude of this impact is also considered to be low, resulting in the significance of the impact being assessed as **negligible beneficial**.

13.4.1.2 Employment Opportunities

The dismantling of WTGs, disposal of materials and reinstatement of land will generate some direct and indirect employment opportunities. A part of those opportunities will be available for local people. The sensitivity of individuals who will get employment is medium, however the magnitude is low, as in the construction phase, which is why this impact is assessed as **minor beneficial**.

13.4.1.3 Livelihoods

During decommissioning, economic displacement may occur for persons who are using the land plots disturbed during dismantling and transport of WTGs and site clearance, whose crops could be affected. The sensitivity of individually affected land users is medium, while the magnitude of the impact is considered low. The significance of the impact is assessed as **minor adverse**.

13.4.2 Impacts Summary

The most positive socio-economic impacts related to the decommissioning phase are those related to the creation of employment opportunities; however, these will be short term. Minor economic displacement of users of land is possible, however with proper mitigation all risks will be reduced. The amount of land which will be available for use again, after decommissioning is less than 10 ha, which is negligible.

13.4.3 Proposed Mitigation/ Control Measure

13.4.3.1 Land Use

- Maximise the amount of land which can be used again and fully restore all previously used land to its original condition. With that, up to 10 ha will be available for use again.

13.4.3.2 Employment and Procurement Opportunities

- Announce employment opportunities locally and encourage women to apply;
- Implement transparent and fair recruitment procedures;
- Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations;
- Provide a grievance mechanism for workers;
- Procure goods and services locally whenever possible.

If the above measures are implemented, more local people will be employed and more goods procured locally, enhancing the positive impact.

13.4.3.3 Livelihoods

The potential for economic displacement and generally any loss of livelihood, as a result of damages to crops will be mitigated by undertaking the following measures:

- Minimise the amount of land occupied / disrupted during construction;
- Compensate all users of land for lost crops and any other damages at full replacement value;
- Fully reinstate the land after disruption;
- Establish and implement a grievance mechanism.

If the above measures are implemented, it is expected that no one will be economically displaced by the project and the impact will be reduced to negligible.

13.4.4 Conclusions

A summary of socio-economic impacts during decommissioning is provided in the tables below.

Impact or Opportunity:	Land rehabilitated and available for use by individual users (low sensitive receptors).	**Ref. No.:**	59
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ ~~Long-term~~/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Maximise the amount of land which can be used again, fully restore all previously used land to its original condition.		
Residual Impact:	Up to 6 ha of land will be available for use again.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-3 Land Rehabilitated and Available for Agricultural Use

Impact or Opportunity:	Employment opportunities for local residents (medium sensitive receptors) during the decommissioning activity.	**Ref. No.:**	60
Characteristics of the Impact or Opportunity:	**Positive**/ ~~Negative~~ **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Announce employment opportunities locally and encourage women to apply; Implement transparent and fair recruitment procedures; Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations; Provide a grievance mechanism for workers.		
Residual Impact:	More local people are employed than originally anticipated.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-4 Employment Opportunities during Decommissioning

Impact or Opportunity:	Involuntary economic displacement of users of land as a result of damages/loss of crops (medium sensitive receptors).	**Ref. No.:**	61
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ ~~Short-term~~/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Minimise the amount of land disrupted land and damages Compensate all users of land for lost crops and any other damages at full replacement value Fully reinstate the land after disruption Establish and implement a grievance mechanism.		
Residual Impact:	No one will be economically displaced by the project.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-5 Involuntary Economic Displacement of Users of Land

13.5 Noise

13.5.1 Impact Assessment

Noise can occur during decommissioning from the dismantling of turbines and associated infrastructure and from breaking out any part of the turbine bases which are above ground. Traffic noise increases can occur on local roads due to the removal of turbine components.

13.5.2 Impacts Summary

Noise during decommissioning will be similar to that assessed for construction noise although lower in overall impact as there will be lower numbers of HGVs involved and no concrete pours.

13.5.3 Proposed Mitigation/ Control Measure

Noise from construction equipment must comply the maximum noise levels specified in the Serbian law. Best practicable means will be used to control noise and vibration in accordance with a decommissioning environmental management plan.

13.5.4 Conclusions

A summary of potential noise impacts during the decommissioning phase is provided in Table 13-7.

Impact or Opportunity:	Increase of noise due to the dismantling of the turbines and the associated infrastructure. Increase traffic noise on local roads due to HGV movements.	**Ref. No.:**	62
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Noise from construction plant is limited by Serbian Law. A decommissioning environmental management plan will be prepared to manage all environmental impacts including noise. Any large abnormal loads will be coordinated with the highway authorities.		
Residual Impact:	No significant residual impact for short-term activity.		

Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-6 Noise Impact - Decommissioning

13.6 Traffic and Transport

Future road infrastructure and associated traffic volumes in the Study Area are likely to increase compared to the current baseline.

13.6.1 Impact Assessment

The decommissioning of Čibuk 2 would generate substantially lower number of traffic movements compared to the construction phase. It is possible that the turbine components would be broken down on site, removing the need for the abnormal loads transport. The dismantled and demolished material would be transported off-site using standard HGVs. The overall effect would be temporary with a medium magnitude of change, resulting in a **minor adverse** impact.

13.6.2 Impacts Summary

The decommissioning transport is expected to generate substantially lower number of traffic movements which would result in a minor adverse impact on the road network and associated traffic.

13.6.3 Proposed Mitigation/ Control Measure

An assessment should be undertaken at an appropriate time to determine whether the turbine components would be broken down and removed by standard heavy vehicles; Should the components be removed for reuse a separate transport assessment should be conducted.

A Decommissioning Transport Management Plan should be developed and implemented to establish the routes for the decommissioning traffic, necessary arrangements and schedule restrictions, notification of public, contractor speed limits, transport within the site, wheel cleaning and dirt control, etc.

Provided that the Decommissioning Transport Management Plan is successfully implemented, the residual impact should be negligible adverse.

13.6.4 Conclusions

A summary of potential transport impacts during the decommissioning phase is provided in Table 13-7.

Impact or Opportunity:	Increase of heavy vehicles traffic on local and regional roads (high to medium sensitive receptors) leading to congestion and nuisance.		**Ref. No.:**	63
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ **Regional**			
Impact Mitigation or Opportunity Enhancement:	An assessment should be undertaken at an appropriate time to determine whether the turbine components would be broken down and removed by standard heavy vehicles; Should the components be removed for reuse a separate transport assessment should be conducted. A Decommissioning Transport Management Plan should be developed and implemented to establish the routes for the decommissioning traffic, necessary arrangements and schedule restrictions, notification of public, contractor speed limits, transport within the site, wheel cleaning and dirt control, etc.			
Residual Impact:	The residual impact on congestion and nuisance should not be significant.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~	

	~~Minor Beneficial~~ ~~Negligible Beneficial~~		~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-7 Transport Impact during the Decommissioning

13.7 Environmental Pollution

Uncontrolled air emissions would present a source of pollution during the decommissioning activities. Generation of large volumes of waste would present a significant environmental issue if not managed properly.

13.7.1 Impact Assessment

13.7.1.1 Air Pollution

The decommissioning phase would not involve excavation works which would be the major source of dust emission during the WPP construction. The emission of dust would be limited and negligible adverse for the receptors and crops within the radius of 500m of the site. The exhaust emissions from the machinery and equipment would contribute to the existing traffic emissions at the local roads. The effect would be short-term and **negligible adverse**.

The air emission during the decommissioning can be controlled by the adoption of similar measures to those implemented during the construction.

13.7.1.2 Generation of Decommissioning Waste

The WPP decommissioning would generate significant volumes of waste (steel, cast iron, concrete, copper, electronics, rubber, oil, fibre glass, resin, etc.). The majority of waste is fit for reuse or recycling and is not considered to present a significant environmental impact if managed properly (if uncontrolled, it could result in a **significant adverse** impact). Currently, the commercial recycling of composite materials is limited due to technological and economic constraints. It is reasonable to expect that in 30 years' time, commercial recycling technologies for the blade material will develop to avoid incineration or landfilling and reduce the environmental footprint of the project.

13.7.2 Impacts Summary

The impact of dust emission and exhaust emission from the decommissioning machinery is considered to be negligible adverse. The decommissioning would generate significant volumes of waste which should be managed in accordance with the waste hierarchy to prevent any significant adverse impacts.

13.7.3 Proposed Mitigation/ Control Measure

13.7.3.1 Air Pollution

A range of measures that should be implemented include: dust suppression (watering and sprinkling), covering of transport vehicles carrying the dusty material, barriers where needed to protect receptors from dust, speed limits on transport roads including dirt tracks, regular maintenance of machinery and vehicles, etc.

With the control measures employed, any emissions would be of a temporary nature minimising any potential for a nuisance to occur. The residual impact would be negligible adverse.

13.7.3.2 Generation of Decommissioning Waste

A Decommissioning Waste Management Plan should be developed and implemented to maximise reuse and recycling and minimise waste disposal to landfill. The Plan should include procedures for waste segregation, interim storage, engagement of licensed waste operators for transport, treatment and safe disposal.

With the appropriate waste management practice implemented, the impact of the decommissioning waste should be negligible adverse.

13.7.4 Conclusions

The summary of potential environmental pollution during the decommissioning stage is provided in Table 13-8 and Table 13-9.

Impact or Opportunity:	Dust emission during decommissioning works and exhaust emissions from machinery and vehicles to weekend houses in the vicinity (highly sensitive receptors).	**Ref. No.:**	64
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Dust suppression techniques (watering and sprinkling) should be applied; Transport vehicles carrying the dusty material should be covered; Barriers should be erected where needed to protect receptors from dust; Speed limits should apply on transport roads including dirt tracks; Regular maintenance of machinery and vehicles should be provided.		
Residual Impact:	Dust propagation should be limited to the decommissioning area and should not influence the local community.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-8 Air Emission Impact during Decommissioning

Impact or Opportunity:	Generation of decommissioning waste.	**Ref. No.:**	65
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ **Regional**		
Impact Mitigation or Opportunity Enhancement:	A Decommissioning Waste Management Plan should be developed and implemented to maximise reuse and recycling and minimise waste disposal to landfill. The Plan should include procedures for waste segregation, interim storage, engagement of licensed waste operators for transport, treatment and safe disposal.		
Residual Impact:	With appropriate reuse and recycling of waste, the residual impact of the decommissioning waste should not be significant.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	~~No Change~~	**Negligible Adverse** ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-9 Generation of Waste during Decommissioning

13.8 Land and Groundwater Quality

The decommissioning phase would have the potential to affect the local ground conditions in case of:

- A poorly executed removal of concrete bases and hardstanding areas and
- an accidental release of hazardous substances contained in the transformers and wind turbine components.

13.8.1 Impact Assessment

13.8.1.1 Impact on Ground Conditions

The decommissioning activity could affect the local ground conditions if a complete removal of concrete base would not be followed by appropriate reinstatement techniques including backfilling. The turbine foundations and crane pads would most likely be only partially removed (typically to 1m below ground level) and the remaining area would be backfilled. The site is moderately prone to erosion and the partial removal of foundations might create ground instability issues or unwanted pathways for groundwater.

An appropriate assessment of ground conditions should be conducted prior to the decommissioning.

13.8.1.2 Accidental Soil and Groundwater Contamination

Transformers and other wind turbine components contain hazardous substances (oil and lubricants). If not controlled properly during the decommissioning, accidental release of these substances can contaminate the local soil and groundwater. Given the volume of insulation oil in the power transformers, accidental release during the removal would present a high magnitude effect and a significant adverse impact on the local agricultural soil, and a medium magnitude effect and a moderate adverse impact on the shallow groundwater aquifer.

Measures should be employed to reduce the risk for soil and groundwater posed by the dismantling and removal operations.

13.8.2 Impacts Summary

The impact of concrete foundations on ground conditions is not considered to be significant, however, an appropriate assessment of ground conditions should be conducted prior to the decommissioning. Potential releases of hazardous substances from the power transformers and wind turbine components would be a significant adverse impact on the local agricultural soil and moderate adverse impact on the shallow groundwater aquifer.

13.8.3 Proposed Mitigation/ Control Measure

13.8.3.1 Impact on Ground Conditions

An assessment should be undertaken at an appropriate time to determine the degree of removal of concrete foundations and subsurface structures, taking into account potential changes over the project lifetime. Based on the assessment, appropriate reinstatement and revegetation techniques should be defined and executed.

Provided that the mitigation measures are implemented, there should be no residual impact on local ground stability.

13.8.3.2 Accidental Release of Hazardous Substances

Appropriate working procedures should be implemented to drain hazardous substances from the transformers and wind turbine components under a controlled method, to safely store them on site and to recycle them or dispose of appropriately;

A Decommissioning Emergency Response Plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc.

Provided that the control measures are implemented, there should be no contamination of land and groundwater at the site.

13.8.4 Conclusions

The summary of potential land and groundwater impacts is provided in Table 13-10 and Table 13-11.

Impact or Opportunity:	Impact of concrete bases on ground conditions (medium sensitive receptor).	Ref. No.:	66
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ ~~Long-term~~/ **Permanent** **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	An assessment should be undertaken at an appropriate time to determine the degree of removal of concrete foundations and subsurface structures, taking into account potential changes over the project lifetime. Based on the assessment, appropriate reinstatement and revegetation techniques should be defined and executed.		

Residual Impact:	There should be no residual impact on local ground stability.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-10 Impact on Ground Conditions during Decommissioning

Impact or Opportunity:	Accidental release of hazardous substances from the power transformers and wind turbine components to land (low sensitive) and groundwater (medium sensitive receptor).		**Ref. No.:**	67
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ ~~Temporary~~/ ~~Short-term~~/ ~~Medium-term~~/ **Long-term**/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~			
Impact Mitigation or Opportunity Enhancement:	Appropriate working procedures should be implemented to drain hazardous substances from the transformers and wind turbine components under a controlled method, to safely store them on site and to recycle them or dispose of appropriately; A Decommissioning Emergency Response Plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc.			
Residual Impact:	There should be no contamination of land and groundwater at the site.			
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~	

Table 13-11 Land and Groundwater Impact during Decommissioning

13.9 Surface water and Wastewater

Future climate projections predict more frequent heavy rainfall events, especially during summer.

13.9.1 Impact Assessment

The decommissioning works would generate sediment transport and silty surface runoff although considerably less than during the construction phase, due to a smaller scale of anticipated ground disturbance. Uncontrolled discharge of sediment run-off into the local drainage canals (low sensitive receptor) could deteriorate their water quality. If uncontrolled, the magnitude of effect is considered to be medium resulting in a **minor adverse** impact.

Sanitary wastewater from workers domestic facilities has a high organic load and should not be discharged into the local canals.

13.9.2 Impacts Summary

The decommissioning works would generate sediment transport and silty surface runoff although considerably less than during the construction phase, due to a smaller scale of anticipated ground disturbance. The impact is assessed as minor adverse prior to mitigation.

13.9.3 Proposed Mitigation/ Control Measure

- Proposed mitigation measures are similar to those during the construction phase:
- Procedure for works during heavy rainfall should be developed and implemented;

- Silty and potentially contaminated runoff from the decommissioning site should be contained to allow settlement and cleaning prior to its release. A drainage system should be designed including appropriate treatment facilities such as settlement ponds, silt fences, and oil interceptors where necessary;
- Hazardous materials or waste should not be stored in the vicinity of the watercourses;
- In the areas where hazardous materials and waste will be stored, secondary containment should be provided to retain any leakage; Spillage kits should be provided at key locations on site and in particular at refuelling areas, and staff should be trained to use them.
- Sanitary facilities should be regularly inspected and wastewater disposed of by a licensed contractor;
- Sanitary wastewater should not be discharged to the local drainage canals.

Provided the proposed measures are implemented there should be no residual impact of wastewater during the decommissioning phase.

13.9.4 Conclusions

A summary of effects related to wastewater impacts during the decommissioning of the proposed Čibuk 2 WPP is provided in Table 13-12.

Impact or Opportunity:	Uncontrolled discharge of silty or contaminated runoff or sanitary wastewater to low sensitive drainage canals during the decommissioning works.	**Ref. No.:**	68
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	Procedure for works during heavy rainfall should be developed and implemented; Silty and potentially contaminated runoff from the decommissioning site should be contained to allow settlement and cleaning prior to its release. A drainage system should be designed including appropriate treatment facilities such as settlement ponds, silt fences, and oil interceptors where necessary; The local watercourses should be protected from surface run-off discharge. Hazardous materials or waste should not be stored in the vicinity; In the areas where hazardous materials and waste will be stored, secondary containment should be provided to retain any leakage; Spillage kits should be provided at key locations on site and in particular at refuelling areas, and staff should be trained to use them. Sanitary facilities should be regularly inspected and wastewater disposed of by a licensed contractor; Sanitary wastewater should not be discharged to the local drainage canals.		
Residual Impact:	There should be no impact on the local canals during the decommissioning phase.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-12 Wastewater Impact during Decommissioning

13.10 Community Health, Safety and Security

Similar to the construction phase, health, safety and security of local residents may be affected during the decommissioning activity by:

- The increase in traffic flows of heavy vehicles and increase of traffic accident risks, and
- unauthorised access to the site and security risks especially during the operation of cranes.

Future baseline in terms of population and settlements in the Study Area cannot be reliably predicted, but it should be noted that the long-term population growth projections for Serbia (and Vojvodina) suggest further decline. Based upon the existing trend, it is reasonable to expect that the local population will at least slightly decrease.

13.10.1 Impact Assessment

13.10.1.1 Impact on Traffic Safety

The decommissioning traffic volumes would be substantially lower than those during the construction phase. Along the road No. 14 between Pančevo and the WPP site, additional HGV traffic may increase the risk of accidents for the local community. This has the potential to be a low magnitude effect with a **minor adverse** significance.

13.10.1.2 Unauthorised Access

Safety and security risks for local community may arise from unintentional or intentional entrance to the site, including potential contact with structures or excavations posing safety hazards. If not controlled, the impact is assessed to be **moderate adverse**.

13.10.2 Impacts Summary

Increased traffic flows of heavy vehicles during the decommissioning phase are considered to present a minor adverse impact on local residents and visitors between WPP site and Alibunar. If unmitigated, unauthorised access to the decommissioning site can have a moderate adverse impact on the safety of local residents.

13.10.3 Proposed Mitigation/ Control Measure

13.10.3.1 Traffic Safety

A Road Safety Management Plan should be developed and implemented (as part of a wider Decommissioning Transport Management Plan) to define traffic safety procedures including but not limited to: details on vulnerable road users along the route, speed controls, training programmes and licences for all drivers, maintenance of vehicles, monitoring of the road condition (removal of dirt and debris). Discussions with the local community should be held, if necessary.

As a result of the proposed measures, the risk of the traffic accidents should be negligible for local residents.

13.10.3.2 Unauthorised Access

- All reasonable measures should be taken to ensure that no unauthorised person enters the decommissioning site;
- Access to working areas should be restricted, including fencing, signage, and communication of risks to the local community;
- A procedure should be developed to ensure that working areas, equipment, tools, machinery do not pose risk to unauthorised visitors.
- Provided that the management measures are implemented, there should be no security risk for the local residents.

13.10.4 Conclusions

A summary of effects related to community health, safety and security impacts during the decommissioning of the proposed Čibuk 2 WPP is provided in Table 13-13, Table 13-14.

Impact or Opportunity:	Traffic safety risk for local residents (highly sensitive receptor) due to increased traffic flows.	**Ref. No.:**	69
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	A Road Safety Management Plan should be developed and implemented (as part of a wider Decommissioning Transport Management Plan) to define traffic safety procedures including but not limited to: details on vulnerable road users along the route, speed controls, training programmes and licences for all drivers, maintenance of vehicles, monitoring of the road condition (removal of dirt and debris). Discussions with the local community should be held, if deemed necessary.		
Residual Impact:	There should be no traffic safety risk for local residents.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-13 Impact on Traffic Safety during Decommissioning

Impact or Opportunity:	Security risk for local residents (highly sensitive receptor) due to unauthorised access to the decommissioning site.	**Ref. No.:**	70
Characteristics of the Impact or Opportunity:	~~Positive~~/ **Negative** **Direct**/ ~~Indirect~~ **Temporary**/ **Short-term**/ ~~Medium-term~~/ ~~Long-term~~/ ~~Permanent~~ **Local**/ ~~National~~/ ~~Regional~~		
Impact Mitigation or Opportunity Enhancement:	All reasonable measures should be taken to ensure that no unauthorised person enters the decommissioning site; Access to working areas should be restricted, including fencing, signage, and communication of risks to the local community; A procedure should be developed to ensure that working areas, equipment, tools, machinery do not pose risk to unauthorised visitors.		
Residual Impact:	There should be no security risk for local residents.		
Residual Impact Rating:	~~Substantial Beneficial~~ ~~Moderate Beneficial~~ ~~Minor Beneficial~~ ~~Negligible Beneficial~~	**No Change**	~~Negligible Adverse~~ ~~Minor Adverse~~ ~~Moderate Adverse~~ ~~Significant Adverse~~

Table 13-14 Impact on Public Security during Decommissioning

14 Summary of Impacts, Mitigations and Control Measures

14.1 Introduction

This Chapter presents a consolidated list of the impacts assessed and mitigations discussed in Chapters 11 to 13 inclusive. This consolidated list has then been used as the basis of the ESMMP presented in Chapter 15.

14.2 Construction Impacts

Construction - Ecology and Nature Conservation				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
n/a	All possible impacts on any ecological feature	• Primary Mitigation already adopted within the Revised Zoning Plan, and adherence to legal requirements, NPCs, and generic GIIP e.g. pre-construction survey and watching brief.	None or Not Significant	**No Change**
n/a	Potential impacts on IBA qualifying species	• No impacts of actively nesting species designated within the adjacent IBA (including European Bee-eater) to be ensured by avoiding breeding seasons or pre-construction surveys and protection of active nest locations. Loss of breeding bank for European Bee-eater will be offset by the recreation of a nesting bank on site.	None or Not Significant	**No Change**

Construction - Socio-Economic				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
1	Reduced amount of land for use by individual users (low sensitive receptors), up to 10 ha in total.	Minimise land that is used/ occupied during construction, compensate any damages to land and crops, preserve all topsoil.	In total up to 10 ha of land will remain permanently unavailable for use after construction. All other land will remain available for use.	**Negligible adverse.**

Construction - Socio-Economic				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
2	Employment opportunities for local residents and procurement opportunities for local companies (medium sensitive receptors).	Announce employment opportunities locally and encourage women to apply; Implement transparent and fair recruitment procedures; Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations; Provide a grievance mechanism for workers. Procure goods and services locally whenever possible.	More local people are employed than originally anticipated. More goods are procured locally than originally anticipated.	**No change.**
3	Increased livelihoods of local households (medium sensitive receptors).	Encourage local employment and procurement to enhance local spending.	More local spending than originally anticipated and better living standard of local households.	**No change.**
4	Enhanced land use for local land owners (medium sensitive receptors) as a result of improved access tracks.	Regular maintenance of access tracks.	Improved land use for local landowners.	**No change.**
5	Damages to road surfaces on roads used by local residents (medium sensitive receptors).	Preparations of roads for heavy transport before construction. Prompt restoration of roads to at least pre-construction level Maintenance of roads during construction.	Although some road damages are to be expected in the short term, regular maintenance will provide improved access to land and land use for local owners and overall good relations with local communities	**Negligible adverse.**

Construction - Traffic and Transport				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
6	Impact on driver delay during the transport of oversized turbine components. The transport of other	A Construction Traffic Management Plan (CTMP) should be developed in consultation with Roads of Serbia, Traffic	No significant residual impacts are anticipated during the abnormal loads transport for the	**Minor to Negligible Adverse.**

Construction - Traffic and Transport				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
	construction material would contribute to a negligible increase (between 7 and 18%) in HGVs movements along the 25km-long route between Pančevo and the WPP site.	Police Department in Pančevo and the municipality of Kovin. The CTMP should include procedures related to off-site and on-site transport, suitable transport routes, arrangements with authorities, timing restrictions to mitigate congestion and nuisance, adverse weather conditions, road condition monitoring, etc.	project. Minor driver delays as a result of temporary road closures. Increase of traffic flows of heavy vehicles would add to the risk of road wear and tear.	

Construction - Landscape and Visual				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
7	Impact on the low sensitive landscape character and fabric during construction.	All ground disturbances should be confined (where possible) to the construction compound, access tracks, turbine base areas, substation compound, and routes for underground cables. Existing vegetation should be suitable protected; land clearance/ vegetation removal should be minimised as far as possible; Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required; Stockpiling of excavated material or construction debris should be avoided; the construction site should be maintained in good condition; The areas disturbed during the construction should be successively restored and reinstated.	A minor portion of the landscape character and fabric would be temporarily affected.	**Minor Adverse.**

Construction - Landscape and Visual				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
8	Visual impact on local residents, visitors, road users, people working in the area during construction, including highly sensitive residential receptors in the vicinity of the site (to the north, east and south).	No specific mitigation measures are proposed. Mitigation of the impact on the landscape character would mitigate the visual impact as well.	Short-term and localised impact, affecting mostly the residents immediately north, east and south of the site and would decrease with the distance.	**Moderate to Minor Adverse.**

Construction - Noise				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
9	Noise and vibration generated from construction activity on the WPP site including making access tracks and turbine hardstanding, concrete pours and the erection of the WTGs.	Noise from construction plant is limited by Serbian Law. A CESMP will be prepared which will detail measures to control noise. Construction work will typically occur during daytime hours only.	Short-term audible noise during construction.	Negligible Adverse
10	Construction traffic including HGVs on local roads	Abnormal loads must be co-ordinated with the highway authorities. The increase in HGVs will cause a minor adverse impact due to the increased noise from traffic.	Short-term traffic noise	Minor Adverse

Construction - Archaeology and Cultural Heritage				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
11	Damage of archaeological artefacts or features by the construction works.	The Developer must finance a pre-construction rescue excavation in the areas of the proposed WTGs No. 1, 8, 12, 18, 33. The financing must be provided at least 12 and not later than 6 months before the commencement of the earthworks.	If suspected archaeological artefacts or chance finds are encountered - potential for slowing down construction. Any findings will increase knowledge	**Minor Beneficial.**

Construction - Archaeology and Cultural Heritage				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
		The Developer should promptly inform the competent authority (Institute for Cultural Heritage in Pančevo) about the commencement of earthworks. During the construction, archaeological supervision of works will be mandatory in the areas of foundations of the WTGs 7, 11, 16, 19, 22, 23, 25, 27, 28, 31. In case of valuable findings, the archaeological rescue excavation will be conducted. A chance finds procedure should be developed and workers trained to implement it. In case of chance finds, all work should be immediately halted and the area protected until the Institute for Cultural Heritage in Pančevo secures the findings.	of archaeological and cultural heritage.	

Construction - Land and Groundwater Quality				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
12	Contamination of soil (low-sensitive) and groundwater (medium-sensitive receptor) due to accidental release of hazardous materials or waste.	Storage of fuels, oils, chemicals, and liquid waste materials should be carried out in designated, dedicated areas, equipped with spillage protection; Fuelling and maintenance of machinery and vehicles should be carried out in a designated area with available spill kits and drip trays; Appropriate working procedures should be implemented to minimise the risk of accidental release during storage and handling of hazardous materials, washing down of plant and equipment and fuelling and maintenance of machinery and vehicles; Emergency response plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc.	There should be no residual impact of soil and groundwater contamination.	**No Change.**

Construction - Land and Groundwater Quality				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
		Water generated by dewatering should be pre-treated in silt busters or sediment tanks prior to discharge to natural recipients (nearby water canals or adjacent land).		
13	Loss, compaction or degradation of agricultural soil (medium-sensitive receptor) during construction.	Removed topsoil should be stored adjacent to the excavated area and later used to cover backfilled areas. Topsoil removal and stockpiling should be halted if topsoil is saturated with water; soil compaction and long-term damage to soil structure will be avoided by handling soils that are in a suitably dry condition and not during wet weather. Removed topsoil should be preserved for re-use. Topsoil stockpiles should have adequate height and slope gradient and their erosion should be prevented by controlled compacting to the level that presents no threat of development of anaerobic processes. Excavations and areas of exposed soils should be reinstated as soon as practicable once construction works are complete at a certain area.	Loss, compaction or degradation of agricultural soil within the project footprint.	**Negligible Adverse.**
14	Impact on local groundwater regime (low sensitive receptor) in case of dewatering.	No specific mitigation measures.	Temporarily lowered groundwater level in the shallow aquifer in the site area.	**Minor Adverse.**

Construction - Surface Water and Wastewater				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
15	Uncontrolled discharge of silty or contaminated runoff to the drainage canals (medium sensitive) during construction.	Procedure for works during wet periods should be developed and implemented. Certain activities (e.g., trenching, excavation) might need to be ceased during periods of intense rainfall.	There should be no residual impact of sediment transport and surface runoff at the site.	**No Change.**

Construction - Surface Water and Wastewater				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
		Silty and potentially contaminated runoff from the construction site should be contained to allow settlement and cleaning prior to its release. A drainage system should be designed including appropriate treatment facilities such as settlement ponds, silt fences, and oil interceptors where necessary. Excavations' face should be kept minimal to avoid the exposure of exposed surfaces to natural conditions. In the areas where hazardous materials and waste will be stored, secondary containment should be provided to retain any leakage; Spillage kits should be provided at key locations on site and in particular at refuelling areas, and staff should be trained to use them.		
16	Uncontrolled release of cement-based products to the drainage canals (low sensitive) during construction.	If concrete batching is undertaken at the site, a designated area should be provided at a safe distance from canals. No discharge of cement-contaminated water to the construction drainage system or to any canal must be allowed. Concrete batching wastewater should be treated in sedimentation ponds and reused where possible. Concrete washout should be conducted in designated areas, lined to prevent infiltration to the subsurface and covered to prevent the collection of rainfall. Solidified content cleaned down from lorry chute should be cleared from the site and disposed of with other construction waste.	There should be no residual impact of concrete wastewater on local drainage canals.	**No Change.**
17	Disturbance of canal banks (medium sensitive receptor) during construction.	During the installation of underground cables beneath the drainage canals, the cable pipeline should be buried at least 1m below the canal bed; Wherever possible, a minimum 15 metre buffer zone should be maintained between the works area and a	There should be no disturbance of canal banks.	**No Change.**

Construction - Surface Water and Wastewater				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
		canal. No storage of material or parking of machinery must be allowed in the buffer zone; In case of any disturbance or damage of a canal, the natural width, depth and bed material must be restored and the banks re-established with native riparian vegetation.		
18	Uncontrolled discharge of sanitary wastewater from workers domestic facilities to drainage canals (low sensitive receptor).	Sanitary facilities should be regularly inspected and wastewater disposed of by a licensed contractor; Sanitary wastewater should not be discharged to the drainage canals.	There should be no impact of sanitary wastewater to the drainage canals.	**No Change.**

Construction - Environmental Pollution				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
19	Dust emission during construction works and exhaust emissions from machinery and vehicles to residential houses in nearby villages (highly sensitive receptors).	Dust suppression techniques (watering and sprinkling) should be applied: • Transport vehicles carrying the dusty material should be covered; • Topsoil stripping should be undertaken close to the period of excavation; • Speed limits should apply on transport roads including dirt tracks. Regular maintenance of machinery and vehicles should be provided.	Dust propagation should be limited to construction area and should not influence the local communities.	**Negligible Adverse.**

Construction - Ecosystem Services				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
20	Disruption to crop cultivation as a priority ecosystem service (a highly sensitive receptor) during the construction activity.	Measures to mitigate the loss of livelihoods as a result of land acquisition are applicable to disruption of the ecosystem service.	Provided that the measures to mitigate the loss of livelihoods are implemented, the residual impact on ecosystem services would be reduced to negligible adverse.	**Negligible Adverse.**

Construction - Community Health, Safety and Security				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
21	Traffic safety risk for local residents and visitors (highly sensitive receptors) in Pančevo and Bavanište due to increased traffic flows.	A Road Safety Management Plan should be developed and implemented (as part of a Construction Transport Management Plan) to define traffic safety procedures including but not limited to: details on vulnerable road users along the route, speed controls, training programmes and licences for all drivers, maintenance of vehicles, monitoring of the road condition (removal of dirt and debris). Consultation with local traffic police should be held related to potential traffic control measures in the area of Bavanište in order to decrease the risk for pedestrians crossing the road and their exposure to drivers overtaking HGVs. Temporary signing should be used to highlight the presence of construction traffic. Discussions with the community of Bavanište should be held in the pre-construction phase to raise awareness on traffic risks during the construction. Temporary signing should be considered along the 1.5km-long section of the municipal road in Bavanište approaching the development site to make aware the drivers of the construction traffic.	There should be no traffic safety risk for local residents and visitors.	**No Change.**

Construction - Community Health, Safety and Security				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
22	Security risk for local residents, road users and farmers due to unauthorised access to the construction site.	All reasonable measures should be taken to ensure that no unauthorised person enters the construction site; Access to working areas should be restricted, including fencing, signage, and communication of risks to the local community; A procedure should be developed to ensure that working areas, equipment, tools, machinery do not pose risk to unauthorised visitors.	There should be no security risk for local community.	**No Change.**

14.3 Operational Impacts

Operation - Ecology and Nature Conservation				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
23	Operational mortality of six highly susceptible bat species, including resident and migratory populations of Leisler's Bat and total population of Nathusius' Pipistrelle Bat of significant conservation value.	Conditional shutdown programme of WTGs 22, 33, and 25. The preliminary shutdown programme must be prepared for implementation at these WTGs from 15 March until 15 November, from sunset until sunrise when all the following thresholds are met: • wind speed (measured from nacelle) 6 m/s or bellow, • temperature 10°C or above, • no heavy rainfall. The proposed shutdown programme would only be implemented if unsustainable mortality of the particular populations is recorded by the post-construction monitoring mortality surveys. In such a case, immediate implementation of the shutdown programme is crucial to effectively mitigate fatalities. Therefore, the shutdown programme must be prepared and ready for implementation should it be needed. The conditional shutdown programme should be implemented through OESMP.	Negligible to minor negative local and not significant.	**No Change**

Operation - Socio-Economic				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
24	Land rehabilitated and available for use to individual users (low sensitive receptors).	Maximise the amount of land which can be used again, fully restore all previously used land to its original condition.	Some land will be available for use in the same way as before the project.	**No change.**
25	Employment opportunities for local residents and procurement opportunities for local companies (medium sensitive receptors).	As for construction related employment, the contracting of any individuals for the operation of the WPP will follow principles of international best practice. To foster the creation of indirect employment opportunities, the Project will continue to procure goods and services locally whenever possible.	More local people are employed and more goods are procured locally than originally anticipated.	**Negligible positive.**
26	Involuntary economic displacement of users of land as a result of damages/loss of crops (low sensitive receptors).	Minimise the amount disrupted land and damages; Compensate all users of land for lost trees and any other damages at full replacement cost; Fully reinstate the land after disruption; Establish and implement a grievance mechanism.	No one will be economically displaced by the project.	**No change.**
27	Revenue generation for local government and communities (medium sensitive receptor).	Ensure that all payments are made in a timely and transparent manner.	Contributions into the municipal budget will provide stability in the long term and will enable the municipality to make more significant investments for the benefit of local residents.	**Minor positive.**
28	Regular maintenance of access tracks to enhance land use by local land owners (medium sensitive receptors).	Regular maintenance of access tracks.	Improved land use for local land owners, leading to maintained positive relationships with the local population.	**Negligible positive.**

Operation - Landscape and Visual				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
29	Impact on the landscape character (low sensitive receptor).	• Mitigation embedded in the design. • No specific landscape enhancement measures are proposed.	Significant effects in the immediate vicinity of the development site (2km), increasing the prominence and scale of turbines compared to the baseline situation. In the wider context of 5km and beyond there would be no significant effect.	**Moderate to Negligible Adverse.**
30	Impact on visual receptors (highly sensitive) in the north and south, within 2.5km of the site.	Bespoke mitigation planting should be considered near a limited number of houses in the western Mramorak, southern Dolovo, and northern Bavanište from which there would be an open view of the turbines at a distance of less than 2.5km. Specific consultation should be undertaken with the affected people and where possible, targeted screening by woodland planting should be considered. Mitigation planting should be with native species, suitably protected, maintained and monitored during medium-term establishment for a minimum of 5 years upon completion of Čibuk 2.	Targeted screening should reduce the visual impact to moderate to minor adverse.	**Moderate to Minor Adverse.**

Operation – Shadow Flicker				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
31	Shadow flicker effects at 8 permanently occupied houses (high sensitive) in the western Mramorak. Cumulative shadow flicker with the Čibuk 1 and Vetrozelena WPP at	Develop and implement a Shadow Flicker Mitigation Plan that should include: • Provision of information to affected people on timing and duration of the effect;	The residual shadow flicker should not exceed the recommended thresholds.	**Negligible Adverse.**

Operation – Shadow Flicker				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
	additional 4 permanently occupied houses in the northern Mramorak.	• Procedure for addressing a complaint received from a receptor and how the shadow flicker occurrence should be verified and mitigation defined; • Liaison with the Vetrozelena WPP to address potential complaints from affected receptors of cumulative shadow flicker; • Mitigation measures (installation of screening structures or planting of vegetative buffers); • Monitoring of mitigation effectiveness; • Shut-down of individual turbines if measures prove to be ineffective.		

Operation - Noise				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
32	Without mitigation the WPP would exceed night-time noise limits based on IFC guidance at small number of properties in Mramorak and Bavanište.	It will be possible to meet the IFC night-time noise limits by operating turbines W7, W22, W23, W25, W26, W27 and W34 at low noise modes. The mitigation would only need to be applied during the night (22.00 to 06.00) and then only to the wind speeds in excess of 6 and 7 m/s at 10 m height. However, as the likelihood of creating a noise nuisance is low, the low noise mode will be used in the event of complaints (and subsequent confirmation of any exceedance by noise monitoring).	Some audible noise	With mitigation, an impact of minor significance is predicted at the two settlements.

Operation - Community Health, Safety and Security				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
33	Damage of the WPP infrastructure due to fire or spreading of fire from the WPP infrastructure to nearby areas.	An Operation Emergency Preparedness and Response Plan should be developed prior to commencement of the WPP operation. The nearby fire brigades and the operator of the commercial gas fields NIS should be consulted for the Plan development. The framework for the Plan should include but not be limited to: • Wind turbine fire response procedure including actions to be taken by the WPP personnel, informing the fire brigade, health and safety protocols; • The WPP operation protocols during fire (remote shut down of turbines, position and pitch of blades, evacuation from the site, etc.); • Fire or explosion response procedure in case of an accident at the natural gas wells; • Monitoring of stubble burning incidents in the area during harvest season and reporting to the nearby fire brigade.	The risk of fire should be negligible.	**Negligible Adverse.**
34	Ice throw-related safety risks to local residents and workers (high sensitive receptor).	Warning signs in respect to ice throw risks should be posted at the entrance to the site; Working procedures should be developed and implemented to ensure the safe work in icing conditions, including the turbine shut down before maintenance; Operational communication with “NIS” and ‘Zlatar’ should be established to ensure safe working conditions for their workers attending the WPP site in icing conditions.	The risk of ice throw-related injury or damage should be negligible.	**Negligible Adverse.**
35	Unauthorised access of local residents (highly sensitive receptor) during the operation phase.	Each turbine access door should be locked; Access to turbine tower ladders should be prevented; The substation should be fenced off and locked; and Signposts should be erected detailing the potential dangers of unauthorised access.	The risk of vandalism or injury due to unauthorized access should be negligible.	**No Change.**

Operation - Traffic and Transport				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
36	Increased traffic of maintenance and repair vehicles along low-sensitive local roads during the WPP operation.	The level of impact is very low and a formal Transport Management Plan for the operation phase is not required.	The operation traffic would not have a significant impact on local traffic and road network.	**Negligible Adverse.**

Operation - Environmental Pollution				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
37	Generation of waste during operation and maintenance activities.	A Waste Management Plan should be developed and implemented, incorporating hierarchy principles: reduce, reuse or recycle whenever possible; Hazardous waste should be stored in a dedicated, closed and secured area, segregated and properly labelled. Spillage protection should be provided. Per Serbian law, hazardous waste shall not be stored longer than 12 months on site; The O&M Contractor should be required to remove all waste from the turbine sites and to separate the interim waste storage facility on-site; The O&M Contractor should be required to keep and maintain waste records and to engage licensed waste transporters and treatment/disposal facilities; Compliance of the O&M Contractor with waste regulations should be periodically checked.	Residual impact of waste generation should be negligible.	**Negligible Adverse.**
38	Accidental releases of hazardous materials or hazardous waste to land (medium sensitive) and groundwater (low sensitive receptor) during the operation.	A Hazardous Material Management Plan should be prepared and implemented. Potential polluting materials (fuels, oils, chemicals) should be stored in dedicated storage areas equipped with	There should be no release of hazardous materials or waste to the ground.	**No Change.**

Operation - Environmental Pollution				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
		secondary containment and other measures to retain any leakage; An Emergency Response Plan (including spill management) should be implemented, addressing any common risks or impacts, defining response, responsibilities, equipment training needs for staff at the site, etc; Spill kits should be stored at key locations on site and staff should be trained in their use; Spill kits should be available to the servicing staff during turbine maintenance. Procedural controls should be applied during draining and filling of oil in turbines; Power transformers and associated bunds should be controlled as part of the regular maintenance and inspection regime. The bunds should be regularly cleaned from rainwater and other debris. If the rainwater is contaminated, it should be managed as hazardous waste by a licensed contractor.		
39	Leakage or release of domestic wastewater from the septic tank to land (medium sensitive) and groundwater (low sensitive) receptor during the operation.	The septic tank should be regularly drained by a licensed contractor and disposed at an appropriately licensed disposal facility. The integrity of the sewage system and septic tank should be periodically tested (once in 5 years per law). During longer duration maintenance activities portable toilets should be provided to the service staff.	There should be no leakage or release from the sewer system.	**No Change.**

Operation – Ecosystem Services				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
40	Disruption of crops cultivation as a priority ecosystem service (a highly sensitive receptor) during the operational period.	Provided that the mitigation measures related to land use and livelihoods during the operational phase are implemented, the residual impact on ecosystem services would be reduced to negligible adverse.	Residual impact on ecosystem services should be negligible adverse.	**Negligible Adverse.**

Operation - Electromagnetic Interference				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
41	Impact on public health of local residents (highly sensitive receptor) due to exposure to electromagnetic fields.	Mitigation is embedded in the design. No additional mitigation measures are proposed.	There will be no impact of electromagnetic radiation on public health.	**No Change.**
42	Electromagnetic interference to telecommunication signals (low sensitive receptor).	Mitigation is embedded in the design. No additional mitigation measures are proposed.	The emission of electromagnetic disturbances from the Čibuk 2 WTGs will be negligible.	**No Change.**

Operation – Aviation and Radar Systems				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
43	Impact on aircraft safety (highly sensitive receptor).	Apply legally required obstruction marking and lighting of turbines for daylight and night visibility and reduced visibility conditions.	There should be no residual impacts on aircraft safety.	**No Change.**

14.4 Decommissioning Impacts

Decommissioning - Ecology and Nature Conservation				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
44	Cannot be clearly described at ESIA stage.	-	-	-

Decommissioning - Landscape and Visual				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
45	Impact on landscape character and fabric (low sensitive receptor) during decommissioning.	Existing vegetation should be suitable protected; land clearance/ vegetation removal should be minimised as far as possible; Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required; Stockpiling of debris should be avoided; the decommissioning site should be maintained in good condition; The disturbed areas should be successively restored and reinstated.	Upon completion of the decommissioning, the site would be reverted to the pre-existing baseline condition.	**No Change.**
46	Visual impact on local residents and road users, including highly sensitive residential receptors in the north and south, during decommissioning.	No specific mitigation measures are proposed.	Short-term and localised impact, affecting mostly the residents in the north-east and south-west and would decrease with the distance.	**Negligible Adverse.**

Decommissioning - Socio-Economic				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
47	Land rehabilitated and available for use by individual users (low sensitive receptors).	Maximise the amount of land which can be used again, fully restore all previously used land to its original condition.	Up to 10 ha of land will be available for use again.	**No change.**
48	Employment opportunities for local residents (medium sensitive receptors) during the decommissioning activity.	Announce employment opportunities locally and encourage women to apply; Implement transparent and fair recruitment procedures; Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations; Provide a grievance mechanism for workers.	More local people are employed than originally anticipated.	**No change.**
49	Involuntary economic displacement of users of land as a result of damages/loss of crops (medium sensitive receptors).	Minimise the amount of land disrupted land and damages Compensate all users of land for lost crops and any other damages at full replacement value Fully reinstate the land after disruption Establish and implement a grievance mechanism.	No one will be economically displaced by the project.	**No change.**

Decommissioning - Noise				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
50	Noise from the dismantling of turbines and associated infrastructure.	Noise from construction plant is limited by Serbian Law. A decommissioning environmental management plan will be prepared which will detail measures to control noise. Decommissioning work will typically occur during daytime hours only.	Some audible noise	**Negligible**

Decommissioning - Traffic and Transport				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
51	Increase of heavy vehicles traffic on local and regional roads (high to medium sensitive receptors) leading to congestion and nuisance.	An assessment should be undertaken at an appropriate time to determine whether the turbine components would be broken down and removed by standard heavy vehicles; Should the components be removed for reuse a separate transport assessment should be conducted. A Decommissioning Transport Management Plan should be developed and implemented to establish the routes for the decommissioning traffic, necessary arrangements and schedule restrictions, notification of public, contractor speed limits, transport within the site, wheel cleaning and dirt control, etc.	The residual impact on congestion and nuisance should not be significant.	**Negligible Adverse.**

Decommissioning - Environmental Pollution				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
52	Dust emission during decommissioning works and exhaust emissions from machinery and vehicles to weekend houses in the vicinity (highly sensitive receptors).	Dust suppression techniques (watering and sprinkling) should be applied. Transport vehicles carrying the dusty material should be covered. Speed limits should apply on transport roads including dirt tracks. Regular maintenance of machinery and vehicles should be provided.	Dust propagation should be limited to the decommissioning area and should not influence the local community.	**Negligible Adverse.**
53	Generation of decommissioning waste.	A Decommissioning Waste Management Plan should be developed and implemented to maximise reuse and recycling and minimise waste disposal to landfill. The Plan should include procedures for waste segregation, interim storage, engagement of licensed waste operators for transport, treatment and safe disposal.	With appropriate reuse and recycling of waste, the residual impact of the decommissioning waste should not be significant.	**Negligible Adverse.**

Decommissioning - Land and Groundwater Quality				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
54	Impact of concrete bases on ground conditions (medium sensitive receptor).	An assessment should be undertaken at an appropriate time to determine the degree of removal of concrete foundations and subsurface structures, taking into account potential changes over the project lifetime. Based on the assessment, appropriate reinstatement and revegetation techniques should be defined and executed.	There should be no residual impact on local ground stability.	**No Change.**
55	Accidental release of hazardous substances from the power transformers and wind turbine components to land (low sensitive) and groundwater (medium sensitive receptor).	Appropriate working procedures should be implemented to drain hazardous substances from the transformers and wind turbine components under a controlled method, to safely store them on site and to recycle them or dispose of appropriately; A Decommissioning Emergency Response Plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc.	There should be no contamination of land and groundwater at the site.	**No Change.**

Decommissioning - Surface water and Wastewater				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
56	Uncontrolled discharge of silty or contaminated runoff or sanitary wastewater to low sensitive drainage canals during the decommissioning works.	Procedure for works during heavy rainfall should be developed and implemented; Silty and potentially contaminated runoff from the decommissioning site should be contained to allow settlement and cleaning prior to its release. A drainage system should be designed including appropriate treatment facilities such as settlement ponds, silt fences, and oil interceptors where necessary; The local watercourses should be protected from surface run-off discharge. Hazardous materials or waste should not be stored in the vicinity;	There should be no impact on the local canals during the decommissioning phase.	**No Change.**

Decommissioning - Surface water and Wastewater				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
		In the areas where hazardous materials and waste will be stored, secondary containment should be provided to retain any leakage; Spillage kits should be provided at key locations on site and in particular at refuelling areas, and staff should be trained to use them. Sanitary facilities should be regularly inspected and wastewater disposed of by a licensed contractor; Sanitary wastewater should not be discharged to the local drainage canals.		

Decommissioning - Community Health, Safety and Security				
Ref. no.	**Impact**	**Proposed Mitigation/ Control Measure**	**Residual Impact**	**Residual Impact Rating**
57	Traffic safety risk for local residents (highly sensitive receptor) due to increased traffic flows.	A Road Safety Management Plan should be developed and implemented (as part of a wider Decommissioning Transport Management Plan) to define traffic safety procedures including but not limited to: details on vulnerable road users along the route, speed controls, training programmes and licences for all drivers, maintenance of vehicles, monitoring of the road condition (removal of dirt and debris). Discussions with the local community should be held, if deemed necessary.	There should be no traffic safety risk for local residents.	**No Change.**
58	Security risk for local residents (highly sensitive receptor) due to unauthorised access to the decommissioning site.	All reasonable measures should be taken to ensure that no unauthorised person enters the decommissioning site; Access to working areas should be restricted, including fencing, signage, and communication of risks to the local community; A procedure should be developed to ensure that working areas, equipment, tools, machinery do not pose risk to unauthorised visitors.	There should be no security risk for local residents.	**No Change.**

15 Mitigation, Management and Monitoring of Environmental and Social Impact

15.1 Project Environmental and Social Management Systems

The impact mitigations and management controls required by this ESIA are summarised in the Environmental and Social Management and Monitoring Plan, or "ESMMP", and will be delivered within the framework of the Project Environmental and Social Management System or "ESMS".

An ESMS General Requirements document will be prepared; this document will describe the over-arching framework and organisation of the integrated environmental, social, health and safety management system that will be applied to Čibuk 2. The aim of the ESMS is to ensure that Čibuk 2 is constructed and operated in compliance with Serbian law and in line with international best practice (the Applicable Requirements, see Section 2.7). The ESMS General Requirements is the equivalent to the System Manual in terms of ISO 14001.

The ESMS General Requirements document will describe:

- The operational standards that will be applied to the Project, referred to as the "Applicable Standards";
- C2WE policy for environmental management, occupational health & safety, labour management, and community health, safety and security;
- Organisation, roles and responsibilities;
- The framework and delivery of the management plans;
- Contractor management;
- Procedures for ensuring ESMS compliance, including inspection and monitoring, audit and review, and internal and external reporting;
- ESMS non-compliance, employee grievance and community grievance;
- ESMS administration.

The initial focus of the General Requirements document will be on the construction phase of the project.

The mitigation, monitoring and performance improvement measures described within the ESMMP will be delivered through the ESMS Management Plans. The ESMS will include three, high level Management Plans: Construction Environmental and Social Management Plan ("CESMP"), Operation Environmental and Social Management Plan ("OESMP") and Decommissioning Environmental and Social Management Plan ("DESMP").

The ESMMP presented below has been divided into three sections: construction, operation and decommissioning (see Table 15-3Table 15-4Table 15-5).

The division of the ESMMP is intended to ensure that the impacts and mitigations identified within this ESIA (Chapter 16) are clearly linked to the CESMP, OESMP and DESMP. The authors of the ESMS Management Plans should not need to re-interpret the ESIA but simply reference the ESMMP. The ESMMP is the bridging document between the ESIA and Project ESMS.

The SEP remains a separate, standalone document that should be read in conjunction with the CESMP, OESMP and the DESMP. The SEP is considered to be a 'living document' which will be reviewed, updated and edited to reflect the requirements of construction, operation and decommissioning.

The CESMP, OESMP and DESMP will include a number of sub-plans that describe the facilities, equipment and management actions for each the risks or impacts identified. The sub-plans are listed in the following sections.

The CESMP for the Čibuk 1 WPP will be used as the basis of the Čibuk 2 CESMP. Prior to construction, the Čibuk 1 CESMP will be:

- Modified to meet the specific requirements of the Čibuk 2 project; e.g. staffing, contractors, location and layout of the Čibuk 2 construction compound, emergency procedures, site security and so on.
- Modified to take account of the "lessons learnt" during the construction of Čibuk 1.

For completeness, these 'lessons learnt' have been listed here to ensure that there is a demonstrable link to the ESMMP, see Table 15-1.

Table 15-1 Lessons Leart from the construction of Čibuk 1

Topic	Lesson Learnt
Wash Pit Management	The wash-out pits for the concrete delivery trucks were not cleared from site as required by the Waste Management Plan. This section of the Waste MP will be reviewed with the positions of wash pits clearly marked in the Plan and on the ground. Residual concrete became a significant problem for local farmers and compensation was paid for damage to ploughs and the loss of crops (see inserted photograph).  Ensure that the contractors have been made aware of the Waste MP, and have provided training to the operators prior to site mobilisation. Engage an individual to monitor plan implementation on day-to-day basis. This individual should report at least once in a week to the C2WE Project Manager on general progress and immediately in the event a non-compliance.
Public Notification Mechanism	In addition to informing the local community on commencement of WPP construction and off-site transportation, C2WE will improve the process for regular and continuous channel of communication throughout entire construction phase and later for operation. It will be later decided should be used for this purpose WPP web site, specially designed app or via social networks (and which one).
Dust suppression	The efficacy of dust management generation during C1 construction needs to be improved. The number and/ or capacity of vehicles able to spray water on the construction tracks will be reviewed.

15.1.1 CESMP sub-plans

The CESMP should be prepared and implemented before the start of construction and may include the following sub-plans:

- Site Mobilisation Management Plan;
- Contractor ESHS Site Management Plan;
- Local Recruitment & Employment Plan.
- Occupational Health and Safety Plan;
- Earthen Material Management Plan;
- Pollution Prevention and Control Plan (including Hazardous and Non-Hazardous Waste Management, Hazardous Substances Management, Water and Wastewater Management);

- Dust Management Plan;
- Noise and Vibration Management Plan;
- Biodiversity Management Plan;
- Chance Find Procedure;
- Construction Transport and Road Safety Management Plan;
- Security Management Plan (if appropriate);
- Community Health and Safety Plan (which should consider Ice Throw and Ice Fall);
- Emergency Preparedness and Response Plan;
- Communicable Diseases Management Plan (if appropriate).

15.1.2 OESMP Sub-plans

On the transition from construction to operation the General Requirements document will be revised to reflect the changing contractual arrangements and management structure. It is not yet known if C2WE will appoint different contractors to operate the WPP, maintain the WTGs and to maintain the Balance of Plant.

An OESMP will be prepared and implemented prior to the start of commercial operation and should take into consideration any lessons learned from the construction phase of the Project. The OESMP will be in place for the whole of the operating life of the WPP but is expected to reviewed annually.

The OESMP will include a requirement for each contractor to develop an ESHS Management Plan that covers the areas of their responsibility. In addition, the OESMP will include a number of operational management sub-plans that may include:

- OHS Management Plan;
- Pollution Prevention and Control Plan (including Hazardous and Non-Hazardous Waste Management, Hazardous Substances Management, Water and Wastewater Management);
- Shadow Flicker Management Plan;
- Noise and vibration Management Plan;
- Community Health and Safety Management Plan;
- Community Grievance Procedure (the basic procedure will be the same as for the construction phase but the contact names and numbers may be different);
- Landscape Management Plan;
- Emergency Preparedness and Response Plan;
- Biodiversity Management Plan (including any requirement for land management (including recreation of European Bee-eater nesting bank) as well as adaptive management based on Mortality and Monitoring Survey effort).

15.1.3 DESMP Sub-Plans

Towards the end of the operational life of the WPP, the owner and operators will decide if the WTGS will be upgraded or replaced (re-powering) or if the WPP will cease operation. Should the WPP be closed then a DESMP will be prepared.

On the transition from operation to decommissioning the General Requirements document will be revised to reflect the changing contractual arrangements and management structure.

A DESMP will be prepared and implemented prior to the start of decommissioning and should take into consideration any lessons learned from the construction phase of the Project. The DESMP may include the following sub-plans:

- Decommissioning and disassembly of the WTGs;
- Decommissioning and removal of the transformers, sub-station and interconnector (if appropriate);
- Removal of underground cables;
- Removal of any buildings and all foundations;

- Pollution Prevention and Control Plan (including Hazardous and Non-Hazardous Waste Management, Hazardous Substances Management, Water and Wastewater Management);
- Material recycling;
- Land restoration.

15.2 Environmental and Social Management and Monitoring Plan

A programme of Environmental and Social Monitoring will be undertaken to monitor the delivery of the ESMMP and to verify the effectiveness of the ESMS. The objectives of the monitoring program are to:

- Record non-compliance and to ensure that remedial action is agreed and implemented
- Evaluate the effectiveness of the ESMS Management Plans and identify any shortcomings.
- Allow refinement and enhancement of mitigation measures to further reduce impacts.
- Allow identification unforeseen issues and to develop additional Management Plans as necessary.

The monitoring will be comprised of weekly inspections and quarterly audits during construction and monthly semi-annual / annual audits during operation (frequencies will be determined). A number of Key Performance Indicators ("KPIs") will be established. Table 15-2 outlines the proposed monitoring programme and possible KPIs.

Table 15-2 Potential Project KPIs

KPI:	Parameter:	Frequency:	Target:
Fugitive dust and particles	Visual observation	Daily	Zero
Ambient noise and vibration	Construction limits: 70 dBA	Noise measurements to be taken in the event of a valid complaint being received.	Compliance
Flora and fauna protection	Visual observation	Weekly	No damage to areas identified in the Biodiversity MP
Provision and use of PPE	Inspection	Daily	Full compliance
Near Miss/ Accident/ Incident	Number	Monthly	No target set
HSE Observation	Number	Monthly	No target set
Safety tool box meeting	Number	Monthly	No target set
Safety Inspections	Number	Monthly	No target set
Water consumption	Cubic metres (m^3)	Monthly	No target set
Road traffic accidents	Number of accidents	Monthly	Zero
Community grievances	Number and trend of resolution	Monthly	All grievances closed.

Table 15-3 Elements of the ESMMP that must Link to the CESMP

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
1	Construction Management (ESMS)	A Construction Environmental and Social Management Plan (CESMP) should be prepared and implemented before the start of construction. The CESMP should include: • Contractor ESHS Site Management Plan; • Occupational Health and Safety Plan; • Site Mobilisation Management Plan; • Earthen Material Management Plan (including consideration of Soil Erosion and Sediment Control); • Pollution Prevention and Control Plan (including Hazardous and Non-Hazardous Waste Management, Hazardous Substances Management, Water and Wastewater Management); • Dust Management Plan; • Noise Management Plan; • Biodiversity Management Plan; • Construction Transport and Road Safety Management Plan; • Community Health and Safety Plan; • Security Management Plan (if appropriate); • Emergency Preparedness and Response Plan; • Chance Find Procedure; • Communicable Diseases Management Plan (if appropriate at the time of construction). The content of these Management Plans (MPs) is described within topic specific sections of this ESMMP.	ESMS General Requirements CESMP	C2WE EPC BoP	(Monthly) ESHS reports prepared by the contractors.	Throughout construction.
2	Employment, local hiring and workforce management	Develop and implement a Local Recruitment and Employment Plan to promote the employment of local workers, and in particularly women. "Local" is defined as living within 40km of the site. The LREP should: • Identify the job roles required and set targets as appropriate. Use targets to measure the success of the LREP. • Announce employment opportunities locally in a timely manner and encourage women to apply.	CESMP Stakeholder Engagement Plan. Community Grievance Mechanism Workers Grievance mechanism Stakeholder engagement activities. Number of grievances recorded.	C2WE Community Liaison Officer (CLO) EPC BoP	CGM Log. WGM log. Corrective Action Reports. Number of local people employed on the Project.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Clearly communicate to the community the employment estimates, timeframes and skills requirements. • Periodically the EPC contractor will publish a list of required roles and will review the list of interested persons. The CLO should make sure this information is disclosed to the communities. The most suitable individuals will be invited for interview and, if suitable, will be offered a job. • WEBG should consider how to invest in skills training to enable greater employment of local population during the construction and operation. • Investigate local sourcing and procurement opportunities to promote sustainable small business development. • Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations. • Provide a grievance mechanism for workers. • Encourage local employment and procurement to enhance local spending.	Monthly workforce statistics. Agreement to provide support to local businesses		Training places provided and completed.	
3	Socio-economic	Any fees and tax payments to local government and communities must be made in a timely and transparent manner. The operator should also support local social or environmental initiatives and development. The operator should continue to provide local organisations with financing support which will enable them to plan and implement more sustainable projects. The regular maintenance of access tracks will improve land use by local land owners. Minimise the amount disrupted land and damage: • Compensate all users of land for lost trees and any other damages at full replacement cost; • Fully reinstate the land after disruption; • Establish and implement a grievance mechanism.	Community Health & Safety MP Provision of information through the SEP and the CGM.	C2WE O&M BoP	Inspection reports Corrective Action Reports Grievance mechanism forms.	Communicated prior to start of operation.
4	Livelihood restoration	All of the land required for the construction and operation of the WPP has been obtained through voluntary agreements, however, involuntary economic displacement can occur as a result of damages to land or crops during construction. All of the affected landowners and farmers working within the construction area will be provided with information prior to	SEP CESMP CGM	C2WE Community Liaison Officer	CGM logs.	Monthly

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		land acquisition and the start of construction, regarding the Community Grievance Mechanism or "CGM". The WPP developer and/or the construction contractors, as relevant, will implement the following mitigation measures: • Minimise the amount of land occupied / disrupted during construction; • Compensate all affected land and any assets on it, at full replacement cost; • Establish and implement the CGM.				
4	Construction Management	Each of the main construction contractors (C2WE or EPC, and BoP) must develop and implement a Contractor ESHS Management Plan. Each MP must consider: • The scope of contractor activities and responsibilities during construction; • the ESHS responsibilities placed upon them by their contract, the project ESMS and the CESMP; • how the minimum requirements of the CESMP and its sub-plans are applied to their activities; • the construction programme and the ESHS risks of the main construction activities; • C2WE (or the EPC) must describe organisation and layout of the construction compound; in particular the location of material and waste stores; • location and access to local hospitals and other healthcare services (including ambulance services); • location and access to local fire-fighting services.	CESMP SEP Location Permit	C2WE EPC BoP	ESHS reports prepared by the contractors. CGM logs.	Monthly, throughout construction.
5	Occupational Health and Safety	Prepare and implement an Occupational Health and Safety Management Plan. The OHS MP must: • Comply with the Project Applicable Requirements. • Provide workers with appropriate personal protective clothing such as helmets, safety boots, gloves, dust masks, ear mufflers, overalls, and safety harnesses for working at height. • Strictly enforce the use of the Personal Protective Equipment to minimise the accidents. • Provide fully equipped First Aid Kit and sanitary facilities on site, including water for drinking and bathing, at all times.	Occupational Health and Safety MP. Construction Traffic MP. Emergency Preparedness and Response Plan. PPE procured and being used by the workers Fire extinguishing facilities on site First aid kit on site Signage installed on site.	C2WE EPC BoP	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs. Record of accidents and near misses Corrective Action Reports Grievance mechanism forms.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Provide appropriate fire extinguishers and train personnel in their use. • Establish a permit to work system for all high-risk activities (i.e., hot works, confident space, working at high etc.) • Train employees on the importance of occupational health and safety requirements and develop work instruction. • Monitor, evaluate and record all training activities, tool-box-talks, risk assessments, provision of PPE, and the investigation of all incidents and near-misses. • Undertake regular inspection to ensure compliance with OHS MP. • Report and investigate all incidences of accidents or near misses and keep proper records of the actions taken. • Promote Covid-19 Awareness (if appropriate). • Provide appropriate traffic safety training to all drivers (employers and contractors) as part of their induction and on an on-going basis.				
6	Mobilisation and Enabling Works	Prepare and implement a Construction Site Mobilisation Plan before any works begins on site. This MP must consider: • Establishment of the construction compound, car parking and lay-down areas; • Transport of heavy equipment to site; • The construction of site access points, the initial widening of existing tracks and the new tracks; • The demolition of any structures owned by C2WE; • Clearance and levelling of construction areas (including the stripping and storage of top soil); • Provision of fuels, water, wastewater storage and electricity to the construction compound; • Establishment of welfare and first aid facilities; • Worker accommodation and welfare. In addition, the Zoning Plan requires that: • Construction of C3 WTGs No. 39, 40, 41, 42 is not allowed as long as the breeding territory of Saker falcon (*Falco cherrug*) is present within this area.	CESMP Earthen Material Management Plan (including consideration of Soil Erosion and Sediment Control) Workers Grievance Mechanism PPE procured and being used by the workers Fire extinguishing facilities on site First aid kit on site	C2WE EPC BoP	(Monthly) ESHS reports prepared by the contractors. WGM log.	Prior to, and during mobilisation.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Cable trenches and turbine foundations should be properly backfilled to keep out burrowing animals and prevent attracting raptors. • Any waste dump (e.g., municipal or construction waste) shall be removed from the WPP site. • Only native plants should be used in restoration of degraded areas. Introduction of invasive species is prohibited. • Develop and implement mitigation measures in case of accidents. • The scope and duration of the post-construction bird and bat monitoring will be defined by the IfNC based upon the results of the pre-construction bird and bat survey.				
7	Groundworks: General	All ground disturbances should be confined (where possible) to the construction compound, access tracks, turbine base areas, substation compound, and routes for underground cables. • Existing vegetation should be suitable protected; land clearance/ vegetation removal should be minimised as far as possible; • Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required; • Stockpiling of excavated material or construction debris should be avoided; the construction site should be maintained in good condition; • The areas disturbed during the construction should be successively restored and reinstated. The Contractor ESHS MPs must take into account the following requirements for the Location Permit: • Cable trenches and turbine foundations should be properly backfilled to keep out burrowing animals and prevent attracting raptors. • WTG concrete foundations are not allowed to be built within wetland habitats (bogs, surface-water depressions, swamps, etc.). • Archaeological supervision shall be conducted during the earthworks for foundations of the WTGs No. 7, 11, 16, 19, 22, 23, 25, 27, 28, 31.	CESMP Earthen Material Management Plan (including consideration of Soil Erosion and Sediment Control) Workers Grievance Mechanism	C2WE EPC BoP	(Monthly) ESHS reports prepared by the contractors. WGM log.	Prior to start of Construction.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• In case of chance finds, all work must be immediately halted and the area protected until the Institute for Cultural Heritage in Panĉevo secures the findings. • If potentially valuable geological or paleontological features are discovered during the excavation works (e.g. fossils, minerals, crystals), the Developer must notify the national Ministry of Environment within 8 days. The Zoning Plan requires that: • Only native plants should be used in restoration of degraded areas. Introduction of invasive species is prohibited.				
8	Groundworks: management of excavated materials	Develop and implement an Earthen Material Management Plan. The EMMP should consider: • Earthworks are sequenced in order to limit the area of exposed soil; • Open earthworks are progressively and rapidly stabilised (e.g., use of mulch, aggregate, geotextile); • Store the top 30cm of topsoil and subsoil separately from areas excavated. Removed topsoil should be preserved for re-use and stored adjacent to the excavated area; • The soil stockpiles should be covered with sheeting and protected from surface run-off. If suitable, the soil should be re-used to backfill the excavated area; • Topsoil removal and stockpiling should be halted if topsoil is saturated with water; soil compaction and long-term damage to soil structure will be avoided by handling soils that are in a suitably dry condition and not during wet weather; • Sediment control measures should be employed. Run-off should be controlled by interception, diverting or conveying to stabilised areas, across slopes at a minimum gradient; • Topsoil stockpiles should have adequate height and slope gradient and their erosion should be prevented by controlled compacting; • All slopes and areas of bare soil should be stabilised before the beginning of snow season. Installation of snow barriers should be considered to reduce the erosion on particularly sensitive disturbed areas;	CESMP Construction Mobilisation Management Plan	C2WE EPC BoP	(Monthly) ESHS reports prepared by the contractors.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Integrity and effectiveness of erosion control and sediment treatment devices should be monitored; • Excavations and areas of exposed soils should be reinstated as soon as practicable once construction works are complete at a certain area. • Upon completion of the construction, the original slope and drainage pattern should be re-established, to the extent possible.				
9	Groundworks: site restoration	Develop and implement a Site Restoration Management Plan. This MP must ensure compliance with the following requirements: • Remove in a timely manner all the construction machinery, equipment and vehicles that are not in use and keep them in specific locations within the Project site. • Reinstate agricultural land once construction areas (including the construction compound) and roads are no longer required. • Conduct a demobilisation audit prior to EPC leaving site to ensure that site conditions are acceptable for handover to the operations team. Where possible, establish native vegetation by natural revegetation in excavated areas immediately after final disturbance. Stockpiles of stripped topsoil with be used for revegetation as it contains native seeds. • Identify potential invasive species and action taken to clear these species if they occur in or around areas designated for vegetation clearance prior to construction. • Consider the implementation of a community benefits strategy to ensure that any visual impacts on the local population is offset by an appropriate level of community benefit.	CESMP Construction Mobilisation Management Plan Earthen Material Management Plan	C2WE EPC BoP	(Monthly) ESHS reports prepared by the contractors.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
10	Pollution Management Control: Non-hazardous solid wastes	Prepare and implement a Pollution Prevention and Control Plan. The PPCP should include consideration of the management and storage of non-hazardous materials and waste and must: • Segregate site wastes by separating hazardous waste from non-hazardous waste. • Train workers on solid waste management practices described in the Storage & Management of Waste MP.	Storage & Management of Waste MP Quantity of solid waste generated. Quantity of solid waste correctly disposed to licensed disposal sites.	C2WE EPC BoP	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs.	Prior to start of Construction. Monitoring carried out during weekly site inspections.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Segregate all solid wastes at source. Provide facilities for proper handling, segregation and storage of wastes at designated points within the construction compound. • Dispose all construction wastes that cannot be recycled or reused to a licensed solid waste disposal site using a licensed refuse handler. • Provide adequate number of properly contained litter bins and containers properly marked with type of wastes. • Strictly prohibit burning or dumping of any wastes at the site. • Perform regular inspection of solid waste management practices onsite. • Implement Duty of Care with respect to waste consignments, tracking where waste is transported to and disposed of.				
11	Pollution Management Control: Hazardous materials / wastes	Prepare and implement a Pollution Prevention and Control Plan. The PPCP should include consideration of the management and storage of hazardous materials and waste and must: • Storage of fuels, oils, chemicals, and liquid waste materials should be carried out in designated, dedicated areas, equipped with spillage protection; • Fuelling and maintenance of machinery and vehicles should be carried out in a designated area with available spill kits and drip trays; • Appropriate working procedures should be implemented to minimise the risk of accidental release during storage and handling of hazardous materials, washing down of plant and equipment and fuelling and maintenance of machinery and vehicles; • Emergency response plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc; • Segregate site wastes by separating hazardous waste from non-hazardous waste; • Provide facilities for proper handling, segregation and storage of hazardous wastes at designated points within the construction compound and provide supplies to clean-up of minor spill;	Storage & Management of Wastes MP Storage and Management of Hazardous Materials MP. Quantity of Hazardous Waste generated. Quantity of Hazardous Waste disposed.	C2WE EPC BoP	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Ensure the hazardous waste collection containers are emptied at appropriate intervals to prevent overflow; • All fuel, oil and chemical storage is stored in a designated secure area. Hoses and valves are checked regularly for signs of wear and ensure that they are turned off and securely locked when not in use; • For heavy equipment, a fuel tanker will be brought to site at a pre-defined time to refuel this equipment at site. Drip trays will be installed under refuelling points; • Containers of hazardous materials should be located on impermeable surfaces with controlled drainage away from natural water courses; • Secondary containment must be provided for all liquid hazardous materials and should be sufficient to contain 110% of the volume of liquids to be stored within. They should also be roofed to stop contamination of rainwater run-off; • Train site workers on proper hazardous waste management; • Incorporate drip trays at machinery, equipment and area prone to contamination by leakage of hazardous materials such as oil and fuel; • Regular maintenance of all equipment and machines used onsite so as to minimise leakage of hazardous materials; • Strictly prohibit illegal disposal of hazardous wastes onsite; • Implement Duty of Care with respect to waste consignments, tracking where waste is transported to and disposed of.				
12	Pollution Management Control: Dust Control	Prepare and implement a Dust Management Plan. The DMP should identify strategies to manage dust on the road during the execution of the Project and include: • Transport vehicles carrying the dusty material should be covered/ sheeted; • Topsoil stripping should be undertaken close to the period of excavation; • Provision of designated wash down area to spray and wash wheel spokes, tyres and around the wheel opening	Transport and Road Safety MP Dust MP CGM and WGM Grievances received.	C2WE EPC BoP	Monthly ESHS reports prepared by the contractors Inspection reports Record of traffic accidents and near misses CGM and WGM logs.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		of all vehicles entering and exiting the construction compound; • Barriers should be erected where needed to protect receptors from dust; • Regular maintenance of vehicles and construction equipment with emission controls; • If necessary, use water to dampen down on-site roads and excavations to reduce dust; • Maximum speed limit of 20kph in place on site; • Communicate project risk to local communities and address concerns accordingly. Monitor any complaints filed (via grievance mechanism) from local stakeholders as an additional tool to monitor dust management measures.				
13	Pollution Management Control: Water and Wastewater	Develop and implement a Water and Wastewater Management Plan that will: • Ensure there is proper and adequate welfare/ sanitation facilities at the site during construction; • Welfare facilities must be provided with septic tank. A specialist contractor must regularly empty the septic tank(s). The wastewater must be disposed off-site to a designated facility by a contracted waste handler in compliance with Serbian regulations; • Any chemical toilets provide at working areas must be provided and managed by a specialist contractor; • Sanitary wastewater should not be discharged to local watercourses. Specifically prohibit the illegal disposal of wastewater into watercourses or to open land; • Ensure regular inspection of wastewater management practices within the construction areas to check for compliance.	Water and Wastewater Management Plan Quantity of wastewater disposed by a licensed waste carrier	C2WE EPC BoP	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs.	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
14	Pollution Management Control: Concrete Batching Plant	If concrete batching is undertaken at the site, it is the responsibility of C2WE to ensure that the plant is appropriately permitted. All emissions and discharges from batching plant must comply with the standards required by IFC Guidelines. In addition: • A designated area should be provided at a safe distance from watercourses;	Water and Wastewater Management Plan	C2WE EPC BoP Provider and operator of the batch plant	Site Inspection Reports	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• No discharge of cement-contaminated water to the construction drainage system or to any watercourse must be allowed; • No discharge of cement-contaminated water to the construction drainage system or to any watercourse must be allowed; • Concrete batching wastewater should be treated in sedimentation ponds and reused where possible; • Concrete washout should be conducted in designated areas, lined to prevent infiltration to the subsurface and covered to prevent the collection of rainfall; • Solidified content cleaned down from lorry chute should be cleared from the site and disposed of with other construction waste.				
15	Construction noise and vibration	Develop and implement a Noise and Vibration Management Plan that: • Adopt and follow best practicable means to ensure that the quietest available plant and construction techniques are used. • Where appropriate, micro-siting of construction equipment is to be undertaken to ensure construction noise impacts are minimised and equipment is located as far as possible from noise sensitive receptors. • Routing of project construction traffic shall be through the main highway and short section of unmarked road to site. • Construction activities will be scheduled, unless otherwise agreed, from Monday to Saturday 08:00 to 22:00. Provide prior information to the community of construction activities outside of these times (such as concrete pouring), or any planned noisy activity that is likely to exceed the permitted noise levels. • Ensure the use of protective personal equipment at all times while on site and noise reduction techniques such as silencers and ear mufflers to employees • Should a noise complaint be received, either during construction, it should be managed through the CGM. An investigation of the complaint will be undertaken and noise measurements undertaken if appropriate. If the noise complaint is valid then a mitigation plan will be agreed with the complainant. Mitigation measures	CESMP Number of noise complaints received.	C2WE EPC BoP	Monthly ESHS reports prepared by the contractors.	Prior to start of Construction. Monitoring carried out following a complaint. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		should consider the provision of double glazing or noise screening.				
16	Biodiversity Management - habitats and plant species of conservation concern, birds, bats, and other fauna of concern	Develop and implement a Biodiversity Management Plan (BMP) to ensure adherence to legal requirements and generic GIIP through the CESMP. The Zoning Plan NPCs requires that: • Only native plants should be used in restoration of degraded areas. Introduction of invasive species is prohibited. The Location Conditions requires that: • Cable trenches and turbine foundations should be properly backfilled to keep out burrowing animals and prevent attracting raptors. • An irrigation canal damaged during the construction must be restored to its prior condition. • WTG concrete foundations are not allowed to be built within wetland habitats (bogs, surface-water depressions, puddles, etc.). In addition, the BMP must ensure that: • Provide training and advice to ensure that construction and maintenance staff (and contractors) are aware of legal requirements and other ecology and nature conservation aspects of the CESMP and capable to implement them; • Develop a Procedure to be applied in the event that nests/ roosts/ lairs are discovered during construction or maintenance works. This procedure should include the requirement to develop a response/ mitigation plan; • In case of chance find or incident, the work should be halted and the area protected and the matter reported immediately to the Nature Conservation for appropriate action. Within the BMP adaptive monitoring and management of key receptors (e.g. adjacent IBA species) must be detailed. This will include but not be limited to detailing of GIIP fatality monitoring program and adaptive mitigation triggered by PBR targets (e.g. shutdown on demand).	CESMP BMP	C2WE EPC BoP	(Monthly) ESHS reports prepared by the contractors	Throughout construction.
20	Traffic and transport management	Undertake a pre-construction route survey to establish the road condition. The survey should include a swept path analysis and bridge assessment. Consultation will be required with services / utility providers to determine the	SEP Construction Transport and Road Safety MP	C2WE Transportation contractor	Monthly ESHS reports prepared by the contractors	Prior to start of Construction.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		exact location of any underground and overhead services / utilities and prior to removal or re-alignment of any overhead cables. The movement of abnormal loads must be co-ordinated with the highway authorities. Consultation with local traffic police should be held related to potential traffic control measures in order to decrease the risk for pedestrians crossing the road and their exposure to drivers overtaking HGVs in prohibited places. Temporary signing should be used to highlight the presence of construction traffic. A Construction Transport and Road Safety Management Plan (CTMP) must be prepared before the start of construction. The Plan must include: • A detailed site access route; speed controls; measures for ensuring well-maintained vehicles and access roads; procedures for ensuring appropriate training programmes and licenses are in place for all drivers; • procedures related to off-site and on-site transport, preferred transport routes, arrangements with authorities (including Roads of Serbia, and the Traffic Police), timing restrictions to mitigate congestion and nuisance (including noise), adverse weather conditions, road condition monitoring, and so on; Prior to the start of WTG delivery, a series of leaflets and notices should be posted making local residents and businesses aware of the dates of the convoys and the disruption that may be caused. The leaflets should include the contact details for the CLO in case anyone would like to use the Community Grievance Mechanism.	CGM Number of road safety briefings provided. Number of road safety complaints received. Number of driving incidents including speed violations.		Monthly PMC audits of the MPs. Inspection reports Record of accidents and near misses WGM and CGM Logs	Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
21	Community Health and Safety	Develop and implement a Community Health & Safety Management Plan. This Plan must ensure that the site security team is aware of the need to establish good relationships with local stakeholders; the grievance mechanism for communities to voice concerns, and to ensure the respect and protection of the local community. • Working procedures should be developed and implemented to ensure the safe work in icing conditions. • All reasonable measures should be taken to ensure that no unauthorised person enters the construction site; • Access to working areas should be restricted, including fencing, signage, and communication of risks to the local community;	CESMP Community Health & Safety MP. Construction Transport and Road Safety MP Emergency Preparedness and Response Plan Provision of information through the SEP and the CGM.	C2WE EPC BoP	Monthly PMC audits of the MPs. Inspection reports Corrective Action Reports Grievance mechanism forms.	Communicated prior to start of Construction. Monitoring carried out during weekly site inspections.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• A procedure should be developed to ensure that working areas, equipment, tools, machinery do not pose risk to unauthorised visitors. • Provided that the management measures are implemented, there should be no security risk for the local community.				
22	Emergency response	Prepare and implement an Emergency Preparedness and Response Plan (EPRP). The EPRP should detail methods for the detection, management and communication (internally and externally) of an emergency. • Work with local emergency responders to at minimum: (i) communicate EPRP; (ii) depending on level of risk from emergency events build local capacity to ensure appropriate local response in case of emergency. • Location and access to local hospitals and other healthcare services (including ambulance services); • Location and access to local fire-fighting services. • Communicate potential risks and EPRP to those potentially most affected by emergency events. • Provide safety information to local community via the SEP. • Emergency drills must be completed.	CESMP Emergency Preparedness and Response Plan Findings of Emergency Drills CGM and WGM Grievances received.	C2WE EPC BoP	Monthly ESHS reports prepared by the EPC Monthly PMC audits of the MPs. Emergency Drills	Prior to start of Construction. Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
24	Site security and access	Develop and implement a Security and Site Access Management Plan. Security provided by a private security firm. Security staff must have the appropriate qualifications and must act in compliance with relevant Serbian laws. The use of weapons of any kind, including sticks and batons, is forbidden. Ensure that robust background checks are carried out staff to make sure they have not been implicated in past abuses. Site security measures: • Fencing of all construction areas, with gates and warning signs on access roads; • Control of access roads to the WTGs and associated equipment; • Fencing off maintenance and equipment storage areas; • 24hour security personnel with security cameras to prevent unauthorised entry to the site compound;	CESMP Security and Site Access Management Plan. Provision of code of conduct for security personnel. Results of background checks for security staff. Minutes of stakeholder meetings. CGM and WGM Grievances received.	C2WE Security contractor	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs. Inspection reports CGM and WGM logs	Communicated prior to start of Construction. Monitoring carried out during weekly site inspections

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Display of contact details for emergency response services and police in the WPP offices, for use in the event of unauthorised entry.				
26	Archaeology and cultural heritage	Develop and implement a Chance Finds Procedure to be applied in the event that artefacts are discovered during construction. • During the construction, archaeological supervision shall be conducted during the earthworks for foundations of the WTGs No. 7, 11, 16, 19, 22, 23, 25, 27, 28, 31. • Train workers on the importance of archaeological and cultural resources and how to deal with them through toolbox talks. • In case of chance find, the work should be stopped immediately and the area protected and the matter reported immediately to the Department of Culture for appropriate action. • If potentially valuable geological or paleontological features are discovered during the excavation works (e.g. fossils, minerals, crystals), the Developer must notify the national Ministry of Environment within 8 days.	CESMP Chance Find Procedure. Number of recorded chance finds.	EPC BoP	Monthly ESHS reports prepared by the contractors	Throughout the construction works.
27	Spread of COVID-19 among the local community	Consider the preparation of a COVID-19 Management Plan. The need for such a plan will depend on the expected prevalence of Covid during the mobilisation and construction phases. The COVID-19 Management Plan should consider establishing hygiene controls in the workplace, medical services that may be required and measures to prevent the transmission in the local community. The Management Plan should establish a hierarchy of controls to limit the spread of COVID-19, including technical controls (testing, cleaning and disinfection, immunisation, separation of infected employees), management procedures (communication, training, work instructions, contact with local community, absence from work) and personal protective equipment.	CESMP Covid 19 MP (if required)	C2WE EPC	Monthly ESHS reports prepared by the contractors.	Throughout the construction works.

Table 15-4 Elements of the ESMMP that must Link to the OESMP

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
1	Operation Management	An Operation Environmental and Social Management Plan (OESMP) should be prepared and implemented before the start of construction. The OESMP should include: • Contractor ESHS Site Management Plan; • OHS Management Plan; • Pollution Prevention and Control Plan (including Hazardous and Non-Hazardous Waste Management, Hazardous Substances Management, Water and Wastewater Management); • Shadow Flicker Management Plan; • Noise and vibration Management Plan; • Community Health and Safety Management Plan; • Community Grievance Procedure (the basic procedure will be the same as for the construction phase but the contact names and numbers may be different); • Landscape Management Plan; • Emergency Preparedness and Response Plan; • Biodiversity Management Plan (including any requirement for Bird and Bat Survey plus Bird and Bat Mortality Survey). The content of these Management Plans (MPs) is described within topic specific sections of this ESMMP.	ESMS General Requirements OESMP	C2WE O&M BoP	(Monthly) ESHS reports prepared by the contractors.	Throughout operation.
2	Ecology and Nature Conservation	Develop and implement a Biodiversity Management Plan. The BMP must: • Ensure that maintenance staff (and contractors) are trained to ensure that they are aware of legal requirements and other nature conservation aspects of the OESMP and capable to implement them. • Ensure the implementation of the Monitoring programme (including bird and bat surveys and mortality surveys). The Location permit requires that: • To protect the migratory species, the WPP must be equipped for continual monitoring of bird and bat movements over the site area. • The post-construction bird and bat monitoring must be undertaken for a period of at least 1 year and must be	OESMP The mortality survey should adopt the methodology developed by the IFC. Bird surveys should adopt the methodology developed by NatureScot (formerly SNH).	C2WE O&M BoP	(Monthly) ESHS reports prepared by the contractors	Throughout operation.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		particularly focused on Saker falcon (*Falco cherrug*) and the WPP site area within 1km of the Kraljevac SNR. Within the BMP adaptive monitoring and management of key receptors (e.g. IBA species) should be considered. This might include but not be limited to detailing of GIIP fatality monitoring program and adaptive mitigation triggered by PBR targets (e.g. shutdown on demand).				
6	Shadow flicker	Develop and implement a Shadow Flicker Mitigation Plan that should include: • Provision of information to effected people on timing and duration of the effect; • Any compliant received should be managed through the CGM. Following the receipt of a complaint, the developer will investigate the complaint, consider the circumstances of the how complaint and agree appropriate mitigation with the complainant; • Mitigation measures may include installation of screening structures or planting of vegetative buffers; • Monitoring of mitigation effectiveness; • Shut-down of individual turbines at selected times should the agreed mitigation measures prove to be ineffective.	OESMP Shadow Flicker Management Plan.	C2WE O&M	Monthly ESHS reports prepared by the contractors. Monthly PMC audits of the MPs. Corrective Action Reports	Following complaint.
8	Operational Noise	Without mitigation the WPP would exceed night-time noise limits based on IFC guidance at small number of properties in Mramorak and Bavanište. It will be possible to meet the IFC night-time noise limits by operating turbines 7, 22, 25, 26, 27 and 34 at low noise modes. The mitigation would only need to be applied during the night (22.00 to 06.00) and then only to the wind speeds in excess of 6 and 7 m/s at 10 m height. However, as the likelihood of creating a noise nuisance is low, the low noise mode will be used in the event of complaints (and subsequent confirmation of any exceedance by noise monitoring). Should any individual wish to raise concerns regarding noise during WPP operation, the compliant should be managed through the CGM. An investigation of the complaint will be undertaken and noise measurements undertaken if appropriate. If the noise complaint is valid then a mitigation plan will be agreed with the complainant. Mitigation measures should consider the provision of double glazing or noise screening.	Community Health & Safety MP Provision of information through the SEP and the CGM.	C2WE O&M BoP	Monthly PMC audits of the MPs. Inspection reports Corrective Action Reports Grievance mechanism forms.	Communicated prior to start of operation. Monitoring carried out during monthly site inspections.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
9	Socio-economic	As for construction related employment, the contracting of any individuals for the operation of the WPP will follow principles of international best practice. To foster the creation of indirect employment opportunities, the Project will continue to procure goods and services locally whenever possible. Any tax payments to local government and communities must be made in a timely and transparent manner. The operator should also support local social or environmental initiatives and development. The operator should provide local organisations with financing support which will enable them to plan and implement more sustainable projects. • The regular maintenance of access tracks will improve land use by local land owners. • Minimise the amount disrupted land and damage: • Compensate all users of land for lost trees and any other damages at full replacement cost; • Fully reinstate the land after disruption; • Establish and implement a grievance mechanism.	Community Health & Safety MP Provision of information through the SEP and the CGM.	C2WE O&M BoP	Inspection reports Corrective Action Reports Grievance mechanism forms.	Communicated prior to start of operation.
10	Community Health and Safety	Develop and implement a Community Health & Safety Management Plan. This Plan must consider the potential impact ice throw and fall. This Plan must ensure that the site security team is aware of the need to establish good relationships with local stakeholders; the grievance mechanism for communities to voice concerns, and to ensure the respect and protection of the local community. An Emergency Preparedness and Response Plan should be developed and implemented that should detail methods for detection and communication of fire event, informing the fire brigade, actions to be taken by the onsite staff, restriction of site access, exclusion zones, and training and practicing. Working procedures should be developed and implemented to ensure the safe work in icing conditions, including the turbine shut down before maintenance. There is a risk that users of ROAD could be struck by ice thrown from the turbine blades. C2WE must consider mechanisms to notify road users and local residents or the risk of ice throw. Warning signs in respect to ice throw risks should be posted at the entrance to the site. • Unauthorised access to the WTGs and electrical facilities should be prevented;	Community Health & Safety MP Provision of information through the SEP and the CGM.	C2WE O&M BoP	Monthly audits of the MPs. Inspection reports Corrective Action Reports Grievance mechanism forms.	Communicated prior to start of Operation. Monitoring carried out during monthly site inspections.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Each turbine access door should be locked; • Access to turbine tower ladders should be prevented; • The substation should be fenced off and locked; and • Signposts should be erected detailing the potential dangers of unauthorised access.				
11	Emergency response	Prepare and implement an Emergency Preparedness and Response Plan (EPRP). • Work with local emergency responders to at minimum: (i) communicate EPRP; (ii) depending on level of risk from emergency events build local capacity to ensure appropriate local response in case of emergency. • Communicate potential risks and the EPRP to those potentially most affected by emergency events. • Provide safety information to local community via the SEP. • Emergency drills must be completed.	Emergency Preparedness and Response Plan Findings of Emergency Drills CGM and WGM Grievances received.	C2WE O&M BoP	Monthly ESHS reports prepared by the EPC Monthly PMC audits of the MPs. Emergency Drills	Prior to start of Operation. Monitoring carried out during monthly site inspections. Mitigation work to be carried out as and when identified.
14	Wastewater	The septic tanks should be regularly drained by a licensed contractor and the effluent should be discharged to a local sewage system off site; Develop and implement a Water and Wastewater Management Plan that will: • Ensure there is proper and adequate welfare/ sanitation facilities at the site during construction. • Welfare facilities must be provided with septic tank. A specialist contractor must regularly empty the septic tank(s). The wastewater must be disposed off-site to a designated facility by a contracted waste handler in compliance with Serbian regulations. • Any chemical toilets provide at working areas must be provided and managed by a specialist contractor. • Specifically prohibit the illegal disposal of wastewater into the canals or on open land. • Ensure regular inspection of wastewater management practices within the construction areas to check for compliance. • The integrity of the sewage system and septic tanks should be periodically tested (once in 5 years per law). The septic tanks should be emptied in regular intervals by a licensed contractor.	Water and Wastewater Management Plan Quantity of wastewater disposed by a licensed waste carrier	C2WE O&M BoP	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs.	Prior to start of Operation. Monitoring carried out during monthly inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
15	Non-hazardous solid wastes	Prepare and implement a Storage & Management of Waste Management Plan that will ensure: • Segregate site wastes by separating hazardous waste from non-hazardous waste. • Train workers on solid waste management practices described in the Storage & Management of Waste MP. • Segregate all solid wastes at source. Provide facilities for proper handling, segregation and storage of wastes at designated points within the construction compound. • Dispose all construction wastes that cannot be recycled or reused to a licensed solid waste disposal site using a licensed refuse handler. • Provide adequate number of properly contained litter bins and containers properly marked with type of wastes. • Strictly prohibit burning or dumping of any wastes at the site. • Perform regular inspection of solid waste management practices onsite. • Implement Duty of Care with respect to waste consignments, tracking where waste is transported to and disposed of.	Storage & Management of Waste MP Quantity of solid waste generated. Quantity of solid waste correctly disposed to licensed disposal sites.	C2WE O&M BoP	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs.	Prior to start of Operation. Monitoring carried out during monthly site inspections.
16	Hazardous materials / wastes	Prepare and implement a Storage & Management of Waste Management Plan that will ensure that: • Storage of fuels, oils, chemicals, and liquid waste materials should be carried out in designated, dedicated areas, equipped with spillage protection. • Fuelling and maintenance of machinery and vehicles should be carried out in a designated area with available spill kits and drip trays; • Appropriate working procedures should be implemented to minimise the risk of accidental release during storage and handling of hazardous materials, washing down of plant and equipment and fuelling and maintenance of machinery and vehicles; • Emergency response plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc • Segregate site wastes by separating hazardous waste from non-hazardous waste.	Storage & Management of Wastes MP Storage and Management of Hazardous Materials MP. Pollution Incident Response Plan Quantity of Hazardous Waste generated. Quantity of Hazardous Waste disposed.	C2WE O&M BoP	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs.	Prior to start of Construction. Monitoring carried out during monthly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Provide facilities for proper handling, segregation and storage of hazardous wastes at designated points within the construction compound and provide supplies to clean-up of minor spills. • Ensure the hazardous waste collection containers are emptied at appropriate intervals to prevent overflow. • All fuel, oil and chemical storage is stored in a designated secure area. Hoses and valves are checked regularly for signs of wear and ensure that they are turned off and securely locked when not in use. • For heavy equipment, a fuel tanker will be brought to site at a pre-defined time to refuel this equipment at site. Drip trays will be installed under refuelling points. • Containers of hazardous materials should be located on impermeable surfaces with controlled drainage away from natural water courses. • Secondary containment must be provided for all liquid hazardous materials and should be sufficient to contain 110% of the volume of liquids to be stored within. They should also be roofed to stop contamination of rainwater run-off. • Train site workers on proper hazardous waste management. • Incorporate drip trays at machinery, equipment and area prone to contamination by leakage of hazardous materials such as oil and fuel. • Regular maintenance of all equipment and machines used onsite so as to minimise leakage of hazardous materials • Strictly prohibit illegal disposal of hazardous wastes onsite. • Implement Duty of Care with respect to waste consignments, tracking where waste is transported to and disposed of.				
17	Occupational Health and Safety	Prepare and implement an Occupational Health and Safety Management Plan that will: • Establish a permit to work system for all high-risk activities (i.e. hot works, confident space, working at high etc.) • Train employees on the importance of occupational health and safety requirements and develop work instruction. • Provide workers with appropriate personal protective clothing such as helmets, safety boots, gloves, dust	OESMP Occupational Health and Safety MP. Emergency Preparedness and Response Plan. PPE procured and being used by the workers	C2WE O&M BoP	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs. Record of accidents and near misses	Prior to start of Operation. Monitoring carried out during monthly inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		masks, ear mufflers, overalls, and safety harnesses for working at height. • Strictly enforce the use of the Personal Protective Equipment to minimise the accidents. • Provide fully equipped First Aid Kit and sanitary facilities on site, including water for drinking and bathing, at all times. • Provision and placement of appropriate fire extinguishers and training personnel on their use • Prohibit unauthorised persons from entering the construction compound. The compound should be fenced and the entrance controlled by the security contractor. • Monitor, evaluate and record all training activities, tool-box-talks, risk assessments, provision of PPE, and the investigation of all incidents and near-misses. • Undertake regular inspection to ensure compliance with OHS MP. • Report and investigate all incidences of accidents or near misses and keep proper records of the actions taken. • Promote Covid-19 Awareness • Provide appropriate traffic safety training to all drivers (employers and contractors) as part of their induction and on an on-going basis.	Fire extinguishing facilities on site First aid kit on site Signage installed on site.		Corrective Action Reports Grievance mechanism forms.	

Table 15-5 Elements of the ESMMP that must Link to the DESMP

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
1	Decommissioning ESMS Management	A Decommissioning Environmental and Social Management Plan (DESMP) should be prepared and implemented before the start of decommissioning. The DESMP must consider: • Decommissioning and disassembly of the WTGs; • Decommissioning and removal of the transformers, sub-station and interconnector (if appropriate); • Removal of underground cables; • Materials recycling;	ESMS General Requirements CESMP DESMP	C2WE Demolition Contractor	(Monthly) ESHS reports prepared by the contractors.	Throughout decommissioning.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Land restoration; The DESMP should include: • Contractor ESHS Decommissioning Site Management Plan; • Occupational Health and Safety Plan; • Pollution Prevention and Control Plan (including Hazardous and Non-Hazardous Waste Management, Hazardous Substances Management, Water and Wastewater Management); • Security Management Plan (if appropriate); • Emergency Preparedness and Response. The content of these Management Plans (MPs) is described within topic specific sections of this ESMMP.				
2	Decommissioning Management	Each of the main contractors must develop and implement a Contractor ESHS Management Plan. Each MP must consider: • The scope of contractor activities and responsibilities during construction; • the ESHS responsibilities placed upon them by their contract, the project ESMS and the DESMP; • how the minimum requirements of the DESMP and its sub-plans are applied to their activities; • the construction programme and the ESHS risks of the main decommissioning activities; • describe organisation of the decommissioning work; in particular the location of material and waste stores; • Location and access to local hospitals and other healthcare services (including ambulance services); • Location and access to local fire-fighting services.	DESMP SEP	C2WE Demolition Contractor	ESHS reports prepared by the contractors. CGM logs.	Throughout decommissioning.
3	Occupational Health and Safety	Update the construction Occupational Health and Safety Management Plan. The OHS MP must: • Comply with the Project Applicable Requirements. • Provide workers with appropriate personal protective clothing such as helmets, safety boots, gloves, dust masks, ear mufflers, overalls, and safety harnesses for working at height. • Strictly enforce the use of the Personal Protective Equipment to minimise the accidents.	DESMP Occupational Health and Safety MP. Emergency Preparedness and Response Plan. PPE procured and being used by the workers Fire extinguishing facilities on site	C2WE Demolition Contractor	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs. Record of accidents and near misses Corrective Action Reports	Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Provide fully equipped First Aid Kit and sanitary facilities on site, including water for drinking and bathing, at all times. • Provide appropriate fire extinguishers and train personnel in their use. • Establish a permit to work system for all high-risk activities (i.e. hot works, confident space, working at high etc.) • Train employees on the importance of occupational health and safety requirements and develop work instruction. • Monitor, evaluate and record all training activities, tool-box-talks, risk assessments, provision of PPE, and the investigation of all incidents and near-misses. • Undertake regular inspection to ensure compliance with OHS MP. • Report and investigate all incidences of accidents or near misses and keep proper records of the actions taken. • Promote Covid-19 Awareness (if appropriate). • Provide appropriate traffic safety training to all drivers (employers and contractors) as part of their induction and on an on-going basis.	First aid kit on site Signage installed on site.		Grievance mechanism forms.	
4	Earthworks: site restoration	Update the Site Restoration Management Plan developed prior to construction. It is important to maximise the amount of land which can be used again, fully restore all previously used land to its original condition. This MP must ensure compliance with the following requirements of the Zoning Plan: • Only native plants should be used in restoration of degraded areas. Introduction of invasive species is prohibited. In addition: • Remove in a timely manner all the construction machinery, equipment and vehicles that are not in use and keep them in specific locations within the Project site. • Reinstate agricultural land once construction areas (including the construction compound) and roads are no longer required.	DESMP	C2WE Demolition Contractor	(Monthly) ESHS reports prepared by the contractors.	Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
5	Pollution Management Control: Non-hazardous solid wastes	Update the construction Pollution Prevention and Control Plan. The PPCP should include consideration of the management and storage of non-hazardous materials and waste and must: • Segregate site wastes by separating hazardous waste from non-hazardous waste. • Train workers on solid waste management practices described in the Storage & Management of Waste MP. • Segregate all solid wastes at source. Provide facilities for proper handling, segregation and storage of wastes at designated points within the construction compound. • Dispose all construction wastes that cannot be recycled or reused to a licensed solid waste disposal site using a licensed refuse handler. • Provide adequate number of properly contained litter bins and containers properly marked with type of wastes. • Strictly prohibit burning or dumping of any wastes at the site. • Perform regular inspection of solid waste management practices onsite. • Implement Duty of Care with respect to waste consignments, tracking where waste is transported to and disposed of.	DESMP Storage & Management of Waste MP Quantity of solid waste generated. Quantity of solid waste correctly disposed to licensed disposal sites.	C2WE Demolition Contractor	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs.	Monitoring carried out during weekly site inspections.
6	Pollution Management Control: Hazardous materials / wastes	Update the construction Pollution Prevention and Control Plan. It is important to maximise reuse and recycling and minimise waste disposal to landfill. An assessment should be undertaken at an appropriate time to determine the degree of removal of concrete foundations and subsurface structures, taking into account potential changes over the project lifetime. Based on the assessment, appropriate reinstatement and revegetation techniques should be defined and executed. The PPCP should include consideration of the management and storage of hazardous materials and waste and must: • Storage of fuels, oils, chemicals, and liquid waste materials should be carried out in designated, dedicated areas, equipped with spillage protection; • Fuelling and maintenance of machinery and vehicles should be carried out in a designated area with available spill kits and drip trays;	DESMP Storage & Management of Wastes MP Storage and Management of Hazardous Materials MP. Quantity of Hazardous Waste generated. Quantity of Hazardous Waste disposed.	C2WE Demolition Contractor	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs.	Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Appropriate working procedures should be implemented to minimise the risk of accidental release during storage and handling of hazardous materials, washing down of plant and equipment and fuelling and maintenance of machinery and vehicles; • Emergency response plan (including spill management) should be implemented, addressing risks or impacts, defining response, responsibilities, equipment, training needs for staff at the site, etc; • Segregate site wastes by separating hazardous waste from non-hazardous waste; • Provide facilities for proper handling, segregation and storage of hazardous wastes at designated points within the construction compound and provide supplies to clean-up of minor spill; • Ensure the hazardous waste collection containers are emptied at appropriate intervals to prevent overflow; • All fuel, oil and chemical storage is stored in a designated secure area. Hoses and valves are checked regularly for signs of wear and ensure that they are turned off and securely locked when not in use; • For heavy equipment, a fuel tanker will be brought to site at a pre-defined time to refuel this equipment at site. Drip trays will be installed under refuelling points; • Containers of hazardous materials should be located on impermeable surfaces with controlled drainage away from natural water courses; • Secondary containment must be provided for all liquid hazardous materials and should be sufficient to contain 110% of the volume of liquids to be stored within. They should also be roofed to stop contamination of rainwater run-off; • Train site workers on proper hazardous waste management; • Incorporate drip trays at machinery, equipment and area prone to contamination by leakage of hazardous materials such as oil and fuel; • Regular maintenance of all equipment and machines used onsite so as to minimise leakage of hazardous materials;				

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Strictly prohibit illegal disposal of hazardous wastes onsite; • Implement Duty of Care with respect to waste consignments, tracking where waste is transported to and disposed of.				
7	Pollution Management Control: Dust Control	Update the construction Dust Management Plan to include: • Provision of designated wash down area to spray and wash wheel spokes, tyres and around the wheel opening of all vehicles entering and exiting the construction compound; • Use of properly maintained vehicles and construction equipment with emission controls; • If necessary, use water to dampen down on-site roads and excavations to reduce dust; • Maximum speed limit of 20kph in place on site; • Trucks carrying aggregates have covered loads when entering or leaving the site; • If necessary, use water to dampen down on-site roads and excavations to reduce dust; • Communicate project risk to local communities and address concerns accordingly. Monitor any complaints filed (via grievance mechanism) from local stakeholders as an additional tool to monitor dust management measures. Dust suppression techniques (watering and sprinkling) should be applied as necessary: • Transport vehicles carrying the dusty material should be covered; • Topsoil stripping should be undertaken close to the period of excavation; • Barriers should be erected where needed to protect receptors from dust; • Speed limits should apply on transport roads including dirt tracks; • Regular maintenance of machinery and vehicles should be provided.	DESMP Transport and Road Safety MP Dust MP CGM and WGM Grievances received.	C2WE Demolition Contractor	Monthly ESHS reports prepared by the contractors Inspection reports Record of traffic accidents and near misses CGM and WGM logs.	Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
8	Pollution Management Control: Water and Wastewater	Update the construction Water and Wastewater Management Plan to:	DESMP Water and Wastewater Management Plan	C2WE Demolition Contractor	Monthly ESHS reports prepared by the contractors	Prior to start of Construction.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• Ensure there is proper and adequate welfare/ sanitation facilities at the site during construction; • Welfare facilities must be provided with septic tank. A specialist contractor must regularly empty the septic tank(s). The wastewater must be disposed off-site to a designated facility by a contracted waste handler in compliance with Serbian regulations; • Any chemical toilets provide at working areas must be provided and managed by a specialist contractor; • Specifically prohibit the illegal disposal of wastewater into the canals or on open land; • Ensure regular inspection of wastewater management practices within the construction areas to check for compliance.	Quantity of wastewater disposed by a licensed waste carrier		Monthly PMC audits of the MPs.	Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
9	Demolition Noise and vibration	Update the construction Noise and Vibration Management Plan to: • Adopt and follow best practicable means to ensure that the quietest available plant and construction techniques are used. • Where appropriate, micro-siting of equipment is to be undertaken to ensure noise impacts are minimised and equipment is located as far as possible from noise sensitive receptors. • Routing of project traffic shall be through the main highway and short section of unmarked road to site. • Demolition activities will be scheduled, unless otherwise agreed, from Monday to Saturday 08:00 to 22:00. Provide prior information to the community of activities outside of these times, or any planned noisy activity that is likely to exceed the permitted noise levels. • Ensure the use of protective personal equipment at all times while on site and noise reduction techniques such as silencers and ear mufflers to employees • Should a noise compliant be received, either during construction, it should be managed through the CGM. An investigation of the complaint will be undertaken and noise measurements undertaken if appropriate. If the noise complaint is valid then a mitigation plan will be agreed with the complainant. Mitigation measures should consider the provision of double glazing or noise screening.	DESMP Number of noise complaints received.	C2WE Demolition Contractor	Monthly ESHS reports prepared by the contractors.	Monitoring carried out following a complaint. Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
10	Traffic management	Update the Construction Transport and Road Safety Management Plan to ensure: • A detailed site access route; speed controls; measures for ensuring well-maintained vehicles and access roads; procedures for ensuring appropriate training programmes and licenses are in place for all drivers; • procedures related to off-site and on-site transport, preferred transport routes, arrangements with authorities (including Roads of Serbia, and the Traffic Police), timing restrictions to mitigate congestion and nuisance (including noise), adverse weather conditions, road condition monitoring, and so on; Prior to the start of decommissioning, a series of leaflets and notices should be posted making local residents and businesses aware of any likely disruption.	DESMP SEP Construction Transport and Road Safety MP Number of road safety briefings provided. Number of road safety complaints received. Number of driving incidents including speed violations.	C2WE Demolition Contractor	Monthly ESHS reports prepared by the contractors Monthly PMC audits of the MPs. Inspection reports Record of accidents and near misses WGM and CGM Logs	Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
11	Emergency response	Update the construction Emergency Preparedness and Response Plan (EPRP). The EPRP should detail methods for the detection, management and communication (internally and externally) of an emergency. • In the event of a fire, the owner must inform the fire brigade and the local Forest Management organisations. The EPRP must summarise the actions to be taken by the onsite staff, restriction of site access, exclusion zones, and training and practicing. • Work with local emergency responders to at minimum: (i) communicate EPRP; (ii) depending on level of risk from emergency events build local capacity to ensure appropriate local response in case of emergency. • Location and access to local hospitals and other healthcare services (including ambulance services); • Location and access to local fire-fighting services. • Communicate potential risks and ERP to those potentially most affected by emergency events. • Provide safety information to local community via the SEP. • Emergency drills must be completed.	DESMP Emergency Preparedness and Response Plan Findings of Emergency Drills CGM and WGM Grievances received.	C2WE Demolition Contractor	Monthly ESHS reports prepared by the EPC Monthly PMC audits of the MPs. Emergency Drills	Monitoring carried out during weekly site inspections. Mitigation work to be carried out as and when identified.
12	Site security and access	Update the construction Security and Site Access Management Plan. Security provided by a private security firm. Security staff must have the appropriate qualifications and must act in	DESMP Security and Site Access Management Plan.	C2WE Demolition Contractor	Monthly ESHS reports prepared by the contractors	Communicated prior to start of Construction.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		compliance with relevant Serbian laws. The use of weapons of any kind, including sticks and batons, is expressly forbidden. Ensure that robust background checks are carried out staff to make sure they have not been implicated in past abuses. Site security measures: • Fencing of all construction areas, with gates and warning signs on access roads; • Control of access roads to the WTGs and associated equipment; • Fencing off maintenance and equipment storage areas; • 24hour security personnel with security cameras to prevent unauthorised entry to the site compound; • Display of contact details for emergency response services and police in the WPP offices, for use in the event of unauthorised entry.	Provision of code of conduct for security personnel. Results of background checks for security staff. Minutes of stakeholder meetings. CGM and WGM Grievances received.		Monthly PMC audits of the MPs. Inspection reports CGM and WGM logs	Monitoring carried out during weekly site inspections
13	Landscape	• Existing vegetation should be suitable protected; land clearance/ vegetation removal should be minimised as far as possible; • Good site management should be implemented with reinstatement of temporary elements and successive removal of features that are no longer required; • Stockpiling of debris should be avoided; the decommissioning site should be maintained in good condition; • The disturbed areas should be successively restored and reinstated.	DESMP BMP	C2WE Demolition Contractor	Monthly ESHS reports prepared by the contractors.	Mitigation work to be carried out as and when identified.
14	Socio-economic	• Announce employment opportunities locally and encourage women to apply; • Implement transparent and fair recruitment procedures; • Ensure that all non-employee workers are engaged in line with both national legislation and applicable international (ILO) standards and recommendations; • Provide a grievance mechanism for workers.	DESMP BMP	C2WE Demolition Contractor	Monthly ESHS reports prepared by the contractors.	Mitigation work to be carried out as and when identified.
15	Biodiversity and habitats	• The impacts of the decommissioning on ecological features could be only very generally assessed at this stage as the nature and the scale of future works is not known.	DESMP BMP	C2WE Demolition Contractor	Monthly ESHS reports prepared by the contractors.	Mitigation work to be carried out as and when identified.

Item No.	Impact or Opportunity	Management Action	MP Reference and KPI (if appropriate)	Responsibility	How Monitored	Monitoring Frequency
		• However, the NPC requires that" upon completion of the WPP operational phase, all structures and equipment must be removed, and the site must be completely restored". Furthermore, the same general legal obligations imposed by the Law on Nature Protection applied during the construction must be adopted during decommissioning.				

15.3 Register of Legal and Other Requirements

The ESMMP refers to the general delivery of the Applicable Requirements but it also includes reference to the delivery of the permit conditions. In addition, the Čibuk 2 project must comply with the Serbian framework of general environmental and health and safety legislation. A register of EHS legal requirements applicable to the Čibuk 2 has been developed by the ESIA consultant to enable the developer to manage this complex issue. This is referred to as the Register of Legal Requirements, see Table 15-6.

The Register will form part of the Project Environmental and Social Management System (ESMS) and sits alongside the ESMMP and the ESMS Management Plans.

Table 15-6 Register of Legal Requirements for Čibuk 2

Item No.	Primary Legislation/ Regulation/ Directive/ Other	Description of the Requirement and Project Application	Adjudicating Body	Limits or Conditions Imposed	Responsibility	Mant. Plan Ref.
Occupational, Health and Safety						
1	Law on Occupational Health and Safety Articles 13, 15, 23, 49	An Employer is obliged to provide a safe working environment. In particular, the employer must: • Complete a Risk Assessment for each task, • appoint an OHS person, • Provide Personal Protective Equipment (PPE) for each employee and control their use, • organize training for employees on working in a healthy and safe way and providing first aid, • keep records of employees' health, and training, • report to authorities on OHS injuries. • regularly test the safety of working equipment, • measure the occupational exposure (e.g. to non-ionising radiation, noise, air temperature, etc.)	Provincial Secretariat for Labour, Employment, and Gender Equality	These requirements will be audited by a specialist, third party consultant. Monthly reports are to be provided to WPP and their contractors.	WPP and their contractors	EHS Management Plan prepared by the O&M Contractor.
Emergency Preparedness						
2	Law on Reducing the Risk of Catastrophic Events and Managing Emergency Situations	Take all necessary mitigation measures to reduce risk of emergencies. The employer is obliged to respond in case of asking by	Ministry of Interior	This requirement will be audited by a specialist, third party consultant. A compliance report will be provided to WPP and their contractors.	WPP and their contractors	Emergency Preparedness and Response Plan

Item No.	Primary Legislation/ Regulation/ Directive/ Other	Description of the Requirement and Project Application	Adjudicating Body	Limits or Conditions Imposed	Responsibility	Mant. Plan Ref.
	Article 30	authority to help when some catastrophic event occur.				EHS Management Plans
3	Law on Fire Protection Article 23, 24, 25	The Operator must develop and implement an internal Regulation on Fire Protection.	Ministry of Interior Fire Safety Department	This requirement will be audited by a specialist, third party consultant. A compliance report will be provided to CVP and their contractors.	WPP and their contractors	Emergency Preparedness and Response Plan EHS Management Plans
Handling and Management of Hazardous Materials						
4	The Law on Environment, Article 29	The management of dangerous substances is carried out under conditions and in a manner that ensures the reduction of the risk of their hazardous properties to the environment and human health in the process of production, storage, use and disposal. The legal and physical person managing hazardous substances shall plan, organize and undertake all necessary preventive, protective, safety and sanitary measures to minimize the risk to the environment and human health.	Provincial Secretary for Urbanism and Environment Environmental Inspection Department	Make a document that defines measures to prevent environmental pollution.	WPP and their contractors	OEMP Emergency Preparedness and Response Plan EHS Management Plans
Waste Management and Disposal						
5	Law on Waste Management Article 15, 26	Waste streams generated at the site have to be classified. Hazardous or potentially hazardous waste streams have to be tested by a certified laboratory and their class code determined. Certificated waste operator for transport, treatment and disposal of waste has to be hired. Waste records should be kept for at least 2 years. If more than 100t of non-hazardous waste or more than 200kg of hazardous waste is generated annually at site then the Operator is obliged to implement a Management Plan.	Provincial Secretary for Urbanism and Environment	This requirement will be audited by a specialist, third party consultant. A compliance report will be provided to CVP and their contractors.	WPP and their contractors	Emergency Preparedness and Response Plan EHS Management Plans

Item No.	Primary Legislation/ Regulation/ Directive/ Other	Description of the Requirement and Project Application	Adjudicating Body	Limits or Conditions Imposed	Responsibility	Mant. Plan Ref.
		Hazardous waste shall not be stored on site for > 12 months.				
Water Permit						
6	Law on Water, Article 122	Upon completion of the construction, the Developer must submit the request for the Water permit. The Water permit sets requirements for wastewater management during the WPP operation, including any activities which might have an impact on the local drainage canals.	Public water management company "Vode Vojvodine"	This requirement will be audited by a specialist, third party consultant. A compliance report will be provided to WPP.	WPP and their contractors	OESMP
7	Law on Water, Article 100	The integrity of septic tanks and associated sewage has to be tested every 5 years.	Provincial Secretary for Agriculture, Water Management and Forestry	This requirement will be audited by a specialist, third party consultant.	WPP and their contractors	CESMP and OESMP
Water Supply						
8	Law on Water, Water Approval for Well (if installed at the site)	Annual reporting on water extraction for the WPP operation purposes to public water management company "Vojvodina Vode".	Provincial Secretary for Agriculture, Water Management and Forestry	This requirement will be audited by a specialist, third party consultant. A compliance report will be provided to WPP and their contractors.	WPP and their contractors	CESMP and OESMP
WPP Decommissioning						
9	The Law on Use of Renewable Energy Sources (Off. Journal of RS, No. 40/2021)	Privileged producers to pay a monthly security deposit during the operational phase for decommissioning of the WPP and restoration of the land. The deposit will be used only in case that the producer does not provide evidence on the WPP decommissioning and land restoration to the Ministry of Mining and Energy. Otherwise, the deposit will be refunded.	Ministry of Mining and Energy	Upon completion of the WPP operational phase, all structures and equipment must be removed, and the site must be completely restored. This requirement will be audited by a specialist, third party consultant.	WPP and their contractors	DESMP

Item No.	Primary Legislation/ Regulation/ Directive/ Other	Description of the Requirement and Project Application	Adjudicating Body	Limits or Conditions Imposed	Responsibility	Mant. Plan Ref.
Location Conditions (i.e. Location Permit)						
10	Law on Planning and Construction (Official Journal of RS, No. 09/2020)	The Location conditions provide specific conditions for connection of the project to the existing infrastructure onsite. The Location conditions include a number of environmental conditions that must be applied. The environmental conditions are prepared by the Institute for Nature Conservation and public water management company "Vojvodina Vode". The cultural heritage conditions are prepared by the Institute for Cultural Heritage from Pančevo.	Provincial Secretariat for Energy, Construction and Transport of Vojvodina	**Construction**: • Cable trenches and turbine foundations should be properly backfilled to keep out burrowing animals and prevent attracting raptors. • A drainage canal damaged during the construction must be restored to its prior condition. • WTG concrete foundations are not allowed to be built within wetland habitats (bogs, surface-water depressions, swamps, etc.). • Archaeological supervision shall be conducted during the earthworks for foundations of the WTGs No. 7, 11, 16, 19, 22, 23, 25, 27, 28, 31. • In case of chance finds, all work must be immediately halted and the area protected until the Institute for Cultural Heritage in Panĉevo secures the findings. • If potentially valuable geological or paleontological features are discovered during the excavation works (e.g. fossils, minerals, crystals), the Developer must notify the national Ministry of Environment within 8 days.	WPP and their contractors	CESMP and OESMP
11	Law on Planning and Construction (Official Journal of RS, No. 09/2020)	The Location permit provides specific conditions for connection of the project to the existing infrastructure onsite. The Location permit includes a number of environmental conditions that must be applied. The environmental conditions are prepared by the Institute for Nature Conservation.	Provincial Secretariat for Energy, Construction and Transport of Vojvodina	**Operation**: • To protect the migratory species, the WPP must be equipped for continual monitoring of bird and bat movements over the site area. • The post-construction bird monitoring must be undertaken for a period of at least 1 year and must be particularly focused on	WPP and their contractors	CESMP and OESMP

Item No.	Primary Legislation/ Regulation/ Directive/ Other	Description of the Requirement and Project Application	Adjudicating Body	Limits or Conditions Imposed	Responsibility	Mant. Plan Ref.
				Saker falcon (Falco cherrug) and the WPP site area within 1km of the Special Nature Reserve 'Kraljevac Bog'.		
Energy Permit						
12	Law on Energy, Article 33	To obtain the Energy Permit, the Developer has to comply with applicable environmental regulatory requirements set by a competent environment authority.	Ministry of Mining and Energy	This requirement will be audited by a specialist, third party consultant. A compliance report will be provided to WPP and their contractors.	WPP and their contractors	CESMP and OESMP
Zoning Plan						
13	Law on Planning and Construction (Official Journal of RS, No. 09/2020)	To initiate the Serbian EIA Study procedure, the local authorities must develop and adopt a Zoning Plan that includes a basic description of a new project. The approval of the Zoning Plan includes consultation with a series of national and regional statutory bodies that provide their conditions under which a development is possible. They indicate potential conflicts with existing or planned infrastructure, may require pre-construction investigations or studies or describe technical and management measures that must be implemented as part of project development.	Municipality of Kovin	The Zoning Plan required that: • Withing the zoning boundary, a total of 41 WTGs are allowed with the maximum height to blade tip of 240m. • Construction of the Čibuk 3 WTGs No. 39, 40, 41, 42 is not allowed as long as the breeding territory of Saker falcon (Falco cherrug) is present within this area. • Cable trenches and turbine foundations should be properly backfilled to keep out burrowing animals and prevent attracting raptors. • The horizontal distance between two turbines shall be at least one height to blade tip. • The final WTG layout should be defined based on results of the one-year pre-construction bird and bat surveys. • Any waste dump (e.g. municipal or construction waste) shall be removed from the WPP site. • Only native plants should be used in restoration of degraded areas. Introduction of invasive species is prohibited.	WPP and their contractors	CESMP and OESMP

Item No.	Primary Legislation/ Regulation/ Directive/ Other	Description of the Requirement and Project Application	Adjudicating Body	Limits or Conditions Imposed	Responsibility	Mant. Plan Ref.
				• Develop and implement mitigation measures in case of accidents. • The scope and duration of the post-construction bird and bat monitoring will be defined by the IfNC based upon the results of the pre-construction bird and bat survey.		

16 Conclusion of the ESIA

16.1 Introduction

Čibuk 2 Wind Energy intend to develop the second phase of the Čibuk Wind Power Plant in Vojvodina Province, in the north east of the Republic of Serbia. The first phase of the Čibuk Project (Čibuk 1) has been in commercial operation since April 2019. Čibuk 1 comprises 57 x 2.78MW wind turbines and has a total capacity of 158 MW. Čibuk 1 is currently the largest WPP in Serbia and during 2020 the operator exported 368.33 GWh of electricity to the national grid.

The second phase of the WPP, Čibuk 2 will consist of up to 25 turbines and have a maximum installed capacity of 155MW. The Čibuk 2 turbines will be installed on the south-western boundary of Čibuk 1.

The Čibuk site was selected in 2010 as Vojvodina has a significant wind resource. The site is accessible and the terrain is suitable for the construction of a large wind power projects. The site is about 4,750 hectares and is used predominantly for intensively managed agricultural production (corn and sunflower). The ecological value of the site is low and the development of the WPP will mean that more than 99% of the land will remain under cultivation.

A new transformer and substation will be installed to serve Čibuk 2. The Čibuk 2 turbines will be connected to the Čibuk 2 substation by 33(35)kV underground cable. Both the Čibuk 1 and Čibuk 2 WPPs will connect to the existing EMS switchyard and then to the national electricity grid via the existing OHL; construction of a new OHL will not be required.

As C2WE is likely to seek financial support for the project from an IFI or a major commercial bank, they have chosen to adopt Good International Industry Practice in the assessment of the environmental and social impact of the Čibuk 2 Project. This ESIA has been prepared in line with the methodology described within IFC Performance Standard 1. The Scoping Study determined that the Čibuk 2 project should be defined as Category B.

The ESIA has investigated, considered, assessed a number of medium- and high-risk effects of Čibuk 2. The following sections describe the conclusions reached, an outline of the suggested mitigations and where appropriate, the level of residual impact. Whilst the main focus of the ESIA is on the mitigation of negative effects, the attention of the reader is drawn to the benefits and opportunities provided by the project such as local employment, tax income and social investment.

16.2 Consideration of High-Risk Effects

16.2.1 WPP Design and WTG Layout

The Čibuk 2 Zoning Plan was adopted in June 2021 and allows for the construction of up to 41 WTGs with a maximum total installed capacity of 315 MW. The Zoning Plan application was based on the installation of 7.5 MW turbines. C2WE propose to construct no more than 41 turbines (up to 25 turbines at Čibuk 2 and up to 15 at Čibuk 3), each with a nominal capacity of 6.1 MW. The Zoning Plan provides the planning framework for both C2 and C3.

Based on the Zoning Plan, the Location conditions were issued for Čibuk 2 (but not C3) in July 2021 for maximum installed capacity of 155MW based on a maximum of 25 turbines. The maximum height to blade tip was set at 240m, the maximum rotor diameter is 190m, maximum blade length is 95m, and maximum hub height is 160m. The Candidate WTG (GE Cypress 6.1-158) has an overall height of 230m, rotor diameter of 158m and a hub height of 240m and is therefore within these limits.

The Location conditions are quite general and do not represent any spatial constraint to the design of Čibuk 2. The compliance with the conditions is described within the ESMMP and will be delivered through the CESMP and the OESMP.

Based on the calculation of ice throw safety distance for the Candidate turbine and the requirements of the IFC EHS Guidelines, the Čibuk 2 ESIA has adopted a safety zone around each turbine of 500m. This diameter is greater than the basic requirement for 1.5 x height to blade tip (1.5 x 230m = 345m) to mitigate the impact of tower collapse or fire.

Whilst the site is currently used for intensive agriculture, there is a biogas plant and three natural gas wells within the WPP site. These facilities are owned and operated by others. However, the wells and the biogas plants are not within the 500m WTG safety zone and are not a constraint to the development of Čibuk 2.

There are no permanently occupied Residential Houses, and only one Summer House, within the boundary of the WPP. The closest sensitive human receptors are the residents of the villages that surround the site.

The Assessment concludes that:

- There are no major constraints to the suggested layout of Čibuk 2.
- The proposed layout allows more than 500m between each WTG and between the WTGs and any sensitive receptors.
- Whilst WTG 22 is likely to cause a minor breach of the IFC guidelines for shadow flicker at eight permanently occupied residential house on the outskirts of Mramorak. A number of mitigation options are available to mitigate the predicted impact of shadow flicker. Some measures would require C2WE to working with the effected people. Consideration will be given to operational hours of WTG 22.
- It is possible that IFC night-time noise limits could be exceeded on the edge of Bavanište at House 11A and the Monastery, as well as House 1C in Mramorak. Should there be a noise complaint this will be investigated by the operator and noise monitoring will be undertaken where appropriate. If the complaint is justifiable, the operator will agree appropriate mitigation with the complainant. It will be possible to meet the IFC night-time noise limits by operating turbines 7, 22, 23, 25, 26, 27 and 34 in low noise mode.

16.2.2 Habitats and biodiversity

The Primary Mitigations proposed by this ESIA, and adopted in the local Zoning Plan, will ensure that almost all the potential negative impacts of the Project on ecological features are either avoided or significantly reduced.

The ESIA concludes that if GIIP mitigation measures are adhered to, there will be no or no significant impact of construction on the majority of ecological features. A European Bee-eater nesting location will be lost, but it will be replaced on site.

The ESIA concludes that there will be **no** or **no significant** impact of **operation** on any designated site, habitat, flora and fauna population, including birds. The is likely to be an impact on six bat species populations, and these are rated as **possibly significant**.

WTG operation may cause limited disturbance to bird activities, although this cannot be considered as displacement for most species, and **no** impact can be ascertained. Detailed assessment of the sustainability of several species populations of significant conservation value and potentially susceptible to displacement, has been undertaken. This assessment clearly indicates that there will be a **negligible** impact, at the most, on the regional populations of Common Quail, Hen Harrier, Saker Falcon, and Tawny Pipit (considered to be the most susceptible species).

Some bird collision fatalities from WTGs are inevitable. The collision risk assessment and assessment of sustainability of the potentially affected populations concludes that there will be a **negligible** impact on the regional populations of Western Marsh Harrier, Hen Harrier, Common Buzzard, European Bee-eater, and Saker Falcon. The remaining species observed within the WPP site are considered not susceptible to collision mortality, of insignificant nature conservation value, or occur at the site only incidentally. Although incidental single collision fatalities of these species cannot be completely excluded, such a low (potential) additional mortality could not affect their populations even at the site level, and **no** impact can be ascertained.

Some bat fatalities from operational WTGs are also inevitable. The ESIA concludes that there will be **no significant** impact on the majority of occurring bat populations due to mortality caused by operating WTGs. The assessment of sustainability of the potentially affected populations concludes that the impact on the highly susceptible species regional populations, the Soprano Pipistrelle Bat, Kuhl's Pipistrelle Bat, Nathusius' Pipistrelle Bat, Parti-coloured Bat, Leisler's Bat, and Noctule Bat, including resident and migratory populations of Leisler's Bat and total population of Nathusius' Pipistrelle Bat of significant conservation value, is **likely negligible**, and, as a precaution, ***possibly low negative regional***. WTGs in the areas of established foraging areas and commuting routes of these species have been identified as potentially the most harmful are numbers 22, 25, and 33; a conditional shutdown programme has been proposed for these turbines.

Between one and three years of post-construction bird and bat monitoring and mortality surveys will be undertaken in accordance with international best practice.

16.2.3 Cumulative Impact

In the anticipation of new Serbian legislation that should regulate the competitive tendering procedure for renewable energy projects, a new cycle of WPP development started in 2020. There are estimations that around 2,000MW of wind power developments will be unlocked by the new regulatory framework.

South Banat is favoured by many developers due to the high wind resource and the predominance of agriculture. At the time of writing, there are eighteen WPPs, in various stages of development (operational, under construction, consented or proposed), within 30km of the Čibuk WPP. The Municipality and the Institute for Nature Conservation do not consider cumulative impacts during the approval of Zoning Plans or when they issue Location conditions. Cumulative effects should be considered by State and Provincial Authorities.

It cannot be predicted if the development of all of the windfarms will ever proceed or if they do, whether the construction activities will overlap. It is inevitable that the construction and operation of a combination of WPPs will have a cumulative environmental and social impact; some beneficial and some detrimental.

16.2.3.1 Impact of the Landscape

The introduction of the Čibuk 1 and other operational WPPs during 2016-2018 has transformed the landscape of the Study Area. From a solely agricultural landscape it became an agricultural landscape with occasional WPPs. However, there are not enough WTGs for the area for them to be considered as a characteristic of the area.

The addition of the Čibuk 2 and Vetrozelena WPPs would increase the presence of WTGs around Dolovo and Mramorak villages to the point where they will become a defining characteristic of the area. The surrounding landscape would be changed from 'landscape with occasional WPPs to 'WPP landscape'. However, as the distance from the area increases, the presence of turbines would decrease, and the level of effect would be reduced to 'landscape with WPPs'. In the wider landscape context of the South Banat Loess Plateau LCA, the landscape would remain one with occasional WPPs.

The cumulative magnitude of change to the landscape is assessed to be high in the immediate landscape around Dolovo and Mramorak (low sensitive landscape receptor), resulting in a moderate adverse cumulative effect. Seen from the wider landscape context, the cumulative magnitude of change in the wider South Banat landscape is considered to be low, resulting in a **minor adverse cumulative effect**. The Vetrozelena WPP will have a significant visual impact on the area due to the layout of the WTGs.

- Within Dolovo and Mramorak villages, when views are not screened by intervening vegetation or buildings, the Čibuk 2 and Vetrozelena turbines would be seen in a close distance. The turbines would appear as one development, evenly spaced, without major stacking or overlapping. Both villages would be surrounded by wind turbines, and only views to the east (from Dolovo) and to the south (from Mramorak) would remain unaffected. This would result in a high magnitude of cumulative change. Taking account of the high receptor sensitivity this will constitute a **major adverse visual effect**.
- Many viewpoints from Deliblato, Skorenovac, Gaj, Kovin would be screened by the landform, buildings or vegetation. Čibuk 2 and Vetrozelena would be seen in a middle-distance and would mostly occupy the left half of the views from these settlements. The Čibuk 1 appears in the right half and is less noticeable, due to the smaller scale of its turbines. The Čibuk 2 and Vetrozelena turbines would be seen as a regularly shaped group. The addition of the Čibuk 2 and Vetrozelena WPPs would result in a cumulative change of medium magnitude and moderate to **minor adverse visual effect**.

16.2.3.2 Impact on Birds and Bats

Due to the growing number of WPPs across the South Banat region, there have been increasing concerns regarding the cumulative impact of bird and bat species. In 2019, the IFC sponsored the South Banat Region Wind Power Projects Rapid Cumulative Impact Assessment. Building upon IFC's RCIA, a comprehensive assessment of cumulative effects was undertaken within the scope of the ESIA. All possible cumulative impacts of South Banat region WPPs on birds and bats are assessed as not significant. However, following the precautionary approach, a particular focus of all WPPs monitoring programmes within the South Banat region should be on operational mortality of bird and bat species populations identified as priority species in IFC's RCIA and this ESIA.

It is noted that the RCIA considered all possible cumulative impacts – loss of habitat, displacement, and collision mortality from WTGs. The report concluded that the potential effect on bird populations as non-existent or negligible. The only possible exception is moderate negative impact at national level on resident Saker Falcon populations.

16.2.4 Landscape and Visual

The large-scale, open and flat local landscape is considered appropriate to accommodate the proposed Čibuk 2 WPP. The subsequent addition of the Čibuk 2 turbines would not fundamentally change the existing landscape character. Similar to the existing Čibuk 1 turbines, the Čibuk 2 would appear as a relatively simple and logical component of the open agricultural landscape.

Significant effects on landscape character would occur out to about 2km where the turbines would dominate both horizontally and vertically, creating **major to moderate adverse** impact significance. As the distance from the site increases, the turbines would appear less prominent in the vast and flat landform, reducing the impact significance to **minor to negligible adverse**.

The Čibuk 2 turbines would be clearly visible and prominent in the view from a limited number of houses on the eastern edges of Mramorak, southern Dolovo, and northern and eastern Bavanište and it would constitute **major adverse** impact significance. From more distant views within a 5km radius (Dolovo, Bavanište, Deliblato) the incremental visual effect compared to the existing situation with the Čibuk 1 WPP would be medium to low adverse, resulting in a **moderate to minor adverse effect**. From more distant settlements (Kovin, Skorenovac, Gaj) the turbines would similarly be visible from houses on the edges of the settlements, but not prominent and thus not significant.

For recreational visitors to the Kraljevac Reservoir, the incremental visual change compared to the current visibility of the Čibuk 1 would be medium to low and the visual effect would be **minor adverse**.

There would be a significant adverse visual effect on travellers on the sections of municipal roads north and east of the site, particularly between Dolovo, Mramorak, and Deliblato, resulting in **moderate to minor adverse** visual effect. With the exception of these areas, the visual effect on road users would be **minor or negligible**.

Beyond about 5km from the site, workers in the open would be subject to a **negligible adverse** effect, between about 2 and 5km a minor adverse visual effect and within 2km of the site a **moderate adverse** visual effect.

The primary mitigation is embedded in the design of the proposed WPP. No specific landscape enhancement measures are proposed.

Bespoke mitigation planting should be considered near a small number of houses in the east (Mramorak), north-west (Dolovo), and south-west (Bavanište) from which there would be an open view of the turbines at a distance of less than 2km. Specific consultation should be undertaken with the effected people and where possible, targeted screening by woodland planting should be considered.

Mitigation planting should be with native species, suitably protected, maintained and monitored during medium-term establishment for a minimum of 5 years upon completion of the proposed Čibuk 2 WPP.

Provided that mitigation planting is successfully implemented, the significant adverse landscape and visual effects will be reduced to the acceptable level - **moderate to minor adverse**.

16.2.5 Shadow Flicker

The shadow flicker assessment suggests that the recommended worst-case threshold of 30 hours per annum could be exceeded at four permanently occupied houses on the south western edge of Mramorak village. These residential houses are predicted to experience between 31 and 40 hours of shadow flicker per annum from C2 WTG No. 22. Additionally, there are four permanently occupied houses in this area where the amount of shadow flicker is predicted to slightly excess the daily threshold of 30 minutes. The effect will occur from November to February between 3pm and 4pm.

In addition, four residential houses in northern Mramorak are predicted to be impacted by the cumulative shadow flicker with the Čibuk 1 and Vetrozelena WPPs.

The shadow flicker threshold will also be exceeded at another 8 unoccupied structures; storage sheds, the biogas plant, crop warehouse and barn.

This impact assessment is considered to be conservative and no account was taken of the lower levels of sunlight during the winter months and any existing screening features (such as scrub growth or trees). It is therefore highly likely that the predicted impact of shadow flickering will be much lower.

For the permanently occupied houses (highly sensitive receptor) the shadow flicker impact is considered to be significant **- moderate adverse effect**.

For the affected industrial and agricultural buildings as receptors of low to negligible sensitivity, the impact is not considered to be significant - **negligible adverse effect.**

A number of mitigation options are available to mitigate the predicted impact of shadow flicker. There is no universal solution applicable to all receptors and some measures would man working with the effected people. All mitigation measures can be applied or adjusted at the WPP operational phase. Provided that any potential shadow flicker effects can be mitigated through the implementation of the Shadow Flicker Management Plan, no significant residual effects are predicted during the operation of Čibuk 2.

16.3 Consideration of Medium-Risk Effects

16.3.1 Socio-economic

Socio-economic impacts related to the construction phase are all assessed as having **minor significance**. Negative impacts include those in relation to land use (noting that less than 10 ha of agricultural land will be lost to WPP infrastructure) and possible damage of crops or to road surfaces. All other impacts are **positive** and they are in relation to the creation of employment and procurement opportunities, causing further positive impacts on local livelihoods, as well as in relation to the upgrading of access tracks, enabling local land owners to access their land with more efficient agricultural machinery. The positive impacts are mostly short term and of a local character.

Following proposed mitigation, the residual impact rating for the key construction related impacts identified are:

- Reduced amount of land for use by individual users - Negligible adverse.
- Employment opportunities for local residents and procurement opportunities for local companies - No change (Minor beneficial).
- Increased livelihoods of local households - No change (Minor beneficial).
- Enhanced land use for local land owners as a result of improved access tracks – No change (Minor beneficial).
- Damages to road surfaces on roads used by local residents - Negligible adverse.

The most significant socio-economic impact during the operation phase is **moderate beneficial** and is in relation to revenue generation for the municipality and donor support for local initiatives. Minor beneficial impacts are expected as a result of regular maintenance of access tracks used by local owners of land. All other impacts are negligible, including any possible economic displacement of users of land if they suffer any losses. The positive impacts are mostly long term and all impacts are of a local character.

Following proposed mitigation, the residual impact rating for the key operations phase impacts identified are:

- Land rehabilitated and available for use to individual users - No change (**Negligible beneficial**).
- Employment opportunities for local residents and procurement opportunities for local companies - No change (**Negligible beneficial**).
- Involuntary economic displacement of users of land – No change **(Negligible adverse**).
- Revenue generation for local government and communities – No change (**Moderate beneficial**).
- Regular maintenance of access tracks to enhance land use by local land owners - No change (**Minor beneficial**).

16.3.2 Traffic and Transport

The transport of general construction material for Čibuk 2 would contribute to a negligible increase (between 7 and 18%) in HGVs movements along the 25km-long route between Pančevo and the WPP site. The route does not pass-through settlements. The potential impact on traffic and transportation would be temporary and short-term, with **negligible adverse** significance impact on severance, driver delay, pedestrian delay and amenity.

The transport of turbine components is assessed to be a temporary change of a low magnitude and a **minor adverse** significance impact.

A Construction Traffic Management Plan (CTMP) should be developed in consultation with Roads of Serbia, Traffic Police Department in Pančevo and the local municipality of Kovin.

Potential residual impacts would likely be minor driver delays as a result of temporary road closures during the oversized transport of turbine components. Increase of traffic flows of heavy vehicles would add to the risk of road wear and tear. No significant residual impacts are anticipated during the construction transport for the project.

16.3.3 Climate Change

The project operational life is considered to be 30 years. It is assumed that the project will be fully operational by 2025 and that the project lifetime will continue to 2055-2060.

Based upon the observed and projected climate change in South Banat the climate change risks that have been identified as relevant for the proposed WPP are air temperature increase, change in rainfall pattern, and change in wind pattern.

The climate change risk analysis for the proposed Čibuk 2 WPP is presented in the table below.

Climate Hazard	Climate Risk	Risk Rating	WPP Operational Risk	Adaptation Measures
More intense and longer heat waves; Increase of number of tropical days and nights.	Maximum daily temperature reaching 35º C and higher.	Medium	• Turbine overheating; • Reduction of turbine power capacity; • Increase of turbine downtime; • Failure of heat-sensitive electrical equipment; • Grid connection issues.	• Mitigation by design: • Reduction of power capacity at 35ºC; • Complete turbine shutdown at 40ºC;
Thunderstorms / increase of days with lightning.	Increased frequency of lightning strikes.	Medium	• Turbine damage/ fire; • Blade damage; • Increased O&M costs.	Mitigation by design: Lightning protection incorporated into the blades; receptors located at multiple points along the blade length.
More frequent and intense windstorms and gusts.	Increased periods of wind speed above the cut-out speed	Low	• Reduction of energy production; • Increase of turbine downtime; • Extreme loading blade fatigue; • Damage of power transmission lines;	Blade condition monitoring. Regular blade inspections.

16.3.4 Operational Noise

The noise assessment has indicated that the noise levels that would be experienced at all the at-risk properties will be within the Serbian day-time and night-time limits. However, at a small number of properties in Mramorak and Bavanište the predicted noise levels will exceed the IFC night-time noise limit (the WPP must not result in a maximum increase in background levels of 3dB at the nearest receptor location). This exceedance is due to the existing low background noise levels at night. At Mramorak (but not Bavanište) the predicted exceedance at some locations is also due to a contribution from Čibuk 1 WTGs.

The Candidate turbine can be operated in a low noise mode. It will be possible to meet the IFC night-time noise limits by operating turbines 7, 22, 23, 25, 26, 27 and 34 in low noise mode. The mitigation would only need to be applied during the night (22.00 to 06.00) and then only to the wind speeds in excess of 6 and 7 m/s at 10 m height. However, as the likelihood of creating a noise nuisance is low, the low noise mode will be used in the event of complaints (and subsequent confirmation of any exceedance by noise monitoring).

Because noise levels will remain relatively low in absolute terms, and below sleep disturbance thresholds and Serbian limits, it is proposed that the use of low noise mode would only occur following a justifiable complaint. Noise monitoring will be undertaken to evaluate any exceedance. With these proposals it will be possible to reduce the impact to a **minor adverse rating**.

Other WPPs are proposed in the area including Vetrozelena which has turbines all around Dolovo and closer to it than Čibuk 1 and Čibuk 2. Cumulative noise levels from any additional proposals will need to be carefully studied.

16.4 Consideration of Low-Risk Effects

The ESIA concluded that impacts associated with these low-risk effects could be mitigated and managed using well known techniques that will be described in the Project ESMS and the associated Management Plans.

An ESMS General Requirements document will be prepared; this document will describe the over-arching framework and organisation of the integrated environmental, social, health and safety management system that will be applied to the Čibuk 2 WPP. The aim of the ESMS is to ensure that Čibuk 2 is constructed and operated in compliance with Serbian law and in line with international best practice (the Applicable Requirements).

The ESIA has described a series of technical requirements (such as the design of the temporary facilities that must be provided during construction) and the management actions within the Environmental and Social Management and Monitoring Plan. These requirements and actions will be elaborated and delivered through a series of Management Plans.

The mitigation, monitoring and performance improvement measures described within the ESMMP will be delivered through the ESMS Management Plans. The ESMS will include three, high level Management Plans: Construction Environmental and Social Management Plan ("CESMP"), Operation Environmental and Social Management Plan ("OESMP") and Decommissioning Environmental and Social Management Plan ("DESMP").

The CESMP, OESMP and DESMP will include a number of sub-plans that describe the facilities, equipment and management actions for each the risks or impacts identified. The Čibuk 2 CESMP is expected to include the following sub-plans:

- Contractor ESHS Site Management Plan;
- Local Recruitment & Employment Plan.
- Occupational Health and Safety Plan;
- Site Mobilisation Management Plan;
- Earthen Material Management Plan;
- Pollution Prevention and Control Plan (including Hazardous and Non-Hazardous Waste Management, Hazardous Substances Management, Water and Wastewater Management);
- Dust Management Plan;
- Noise and Vibration Management Plan;
- Biodiversity Management Plan;
- Chance Find Procedure;
- Construction Transport and Road Safety Management Plan;
- Security Management Plan (if appropriate);
- Community Health and Safety Plan (which should consider Ice Throw and Ice Fall);
- Emergency Preparedness and Response Plan;
- Communicable Diseases Management Plan (if appropriate).

During the operational life of the WPP the Operation Environmental and Social Management Plan ("OESMP") will be the primary ESHS management, control and reference document. The OESMP will describe the framework for the management of the project ESHS risks during the operational life of the WPP to ensure compliance with the Applicable Requirements. The OESMP sub-plans are expected to be:

- OHS Management Plan;
- Pollution Prevention and Control Plan (including Hazardous and Non-Hazardous Waste Management, Hazardous Substances Management, Water and Wastewater Management);
- Shadow Flicker Management Plan;
- Noise and vibration Management Plan;
- Community Health and Safety Management Plan;

- Community Grievance Procedure (the basic procedure will be the same as for the construction phase but the contact names and numbers may be different);
- Landscape Management Plan;
- Emergency Preparedness and Response Plan;
- Biodiversity Management Plan (including any requirement for land management as well as Mortality Survey).

A DESMP will be prepared and implemented prior to the start of decommissioning and should take into consideration any lessons learned from the construction phase of the Project. The DESMP may include the following sub-plans:

- Decommissioning and disassembly of the WTGs;
- Decommissioning and removal of the transformers, sub-station and interconnector (if appropriate);
- Removal of underground cables;
- Removal of any buildings and all foundations;
- Pollution Prevention and Control Plan (including Hazardous and Non-Hazardous Waste Management, Hazardous Substances Management, Water and Wastewater Management);
- Material recycling;
- Land restoration.

Document End