



**Wind farms ZD2P and ZD3P**

**Environmental and Social Due Diligence**

**Non-Technical Summary**

**Kunovac d.o.o.**

Zagreb, April 2022

# Table of Contents

<b>1. INTRODUCTION .....</b>	<b>1</b>
<b>2. PROJECT DESCRIPTION .....</b>	<b>2</b>
<b>2.1. Project location .....</b>	<b>2</b>
<b>2.2. Project components.....</b>	<b>5</b>
<b>3. PROJECT HISTORY, ADMINISTRATIVE PROCEDURES AND PERMITS .....</b>	<b>6</b>
<b>4. CURRENT CONDITION OF EXISTING ENVIRONMENT AND SOCIO-ECONOMIC CONDITIONS.....</b>	<b>7</b>
<b>5. IDENTIFIED IMPACTS, MITIGATION MEASURES AND MONITORING .....</b>	<b>9</b>
<b>5.1. Impacts during construction.....</b>	<b>9</b>
5.1.1. Flora and Habitats.....	9
5.1.2. Bats .....	10
5.1.3. Birds.....	10
5.1.4. Soil and groundwater .....	11
5.1.5. Air quality .....	12
5.1.6. Waste .....	12
5.1.7. Noise .....	12
5.1.8. Landscape.....	12
5.1.9. Traffic .....	12
5.1.10. Health, Safety and Labour.....	13
<b>5.2. Impacts during operation .....</b>	<b>13</b>
5.2.1. Birds and bats .....	13
5.2.2. Waste .....	13
5.2.3. Accident Hazards.....	13
5.2.4. Noise .....	14
5.2.5. Electromagnetic fields .....	14
5.2.6. Flickering.....	14
5.2.7. Cumulative impacts .....	15
<b>5.3. Post-construction monitoring .....</b>	<b>18</b>
<b>6. ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM .....</b>	<b>18</b>
<b>7. FURTHER INFORMATION .....</b>	<b>19</b>

# 1. INTRODUCTION

This Non-technical Summary (NTS) provides an overview of the environmental and social impacts associated with the construction and operation of the wind farms (WF) ZD2P and ZD3P (hereinafter referred to as “the Project”) and on the measures considered to keep these potential impacts at acceptable levels.

WF ZD2P is owned by the special purpose company KUNOVAC d.o.o. (hereinafter referred to as “the Company”). WF ZD3P was previously owned by special purpose company VENTUS FLATUS d.o.o. As of February 21, 2022, Ventus Flatus d.o.o. was merged into is Kunovac d.o.o. which resulted in the combination of both projects into a single project company.

The developer of both projects is privately owned company ENCRO d.o.o. (hereinafter referred to as “The Developer”) which will provide full engineering, procurement, construction, technical and commercial management of the Project. ENCRO has been successfully managing several wind farms in Croatia totalling 141,4 MW.

Wind farms ZD2P and ZD3P were subject to national environmental impact assessment (EIA) procedures in 2014 and 2020 with associated public consultation and public disclosure in accordance with national legal and permitting requirements. Environmental decisions with prescribed mitigation measures and monitoring plan have been obtained for both wind farms.

WFs ZD2P and ZD3P are in pre-construction phase and all required approvals and permits to start construction for both wind farms are obtained.

The Company is seeking to enter into a financial agreement with financial institutions which may have additional requirements besides the Croatian procedures already completed. An independent Environmental and Social Due Diligence (ESDD) was undertaken as required by the prospective project financiers.

ESDD confirmed that wind farms ZD2P and ZD3P are compliant with national legislation and that appropriate EIA process was undertaken in compliance with EU EIA Directive.

Both wind farms have been initially screened as a category B projects, following the European Bank for Reconstruction and Development’s (EBRD) Environmental and Social Policy (2019). Results of ESDD confirmed initially screened category B, since the potential adverse environmental and social impacts will be largely reversible and can be mitigated through already available and recommended mitigation measures. ESDD confirmed that the Project is structured to comply with the EBRD’s Performance Requirements (PR’s).

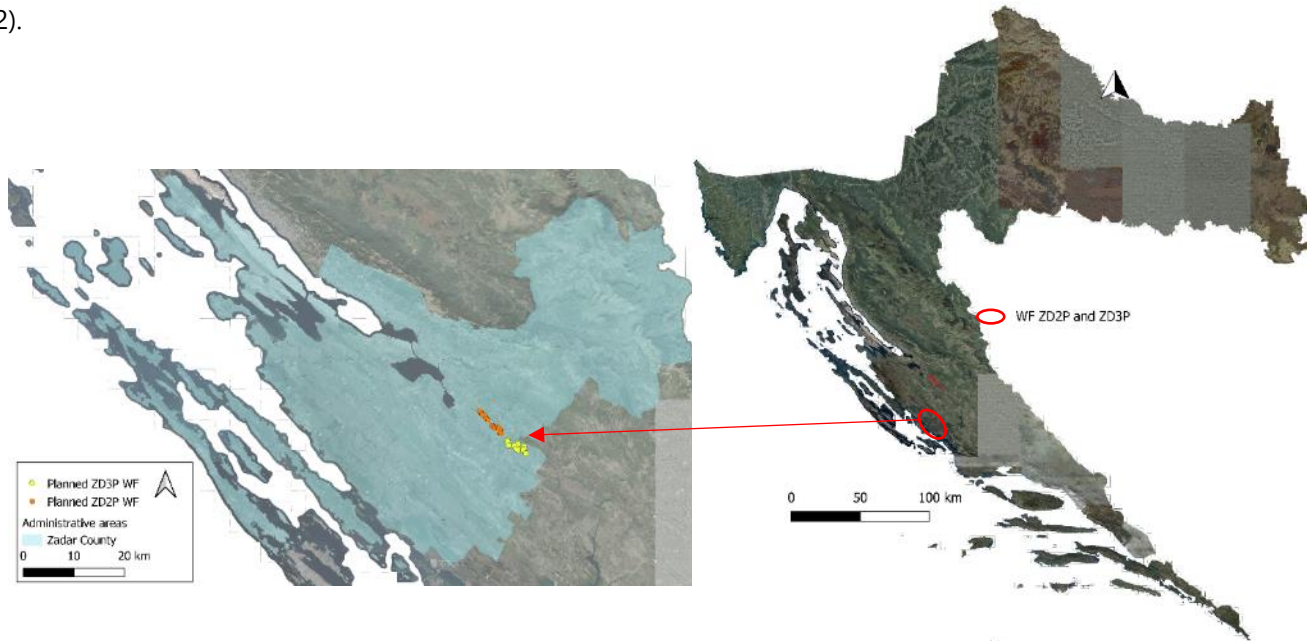
The following additional studies and documents were commissioned so that the Project also meets the requirements of the EBRD, International Finance Corporation’s (IFC) Performance Standards and Environmental, Health and Safety (EHS) Guidelines for Wind Energy and Equator Principles:

- this Non-technical Summary (NTS)
- Stakeholder Engagement Plan (SEP)
- Environmental and Social Action Plan (ESAP).

## 2. PROJECT DESCRIPTION

### 2.1. Project location

WFs ZD2P and ZD3P are planned in Zadar County (Figure 2-1). WF ZD3P will be located, in the administrative boundaries of the City of Benkovac, while nine wind turbines of WF ZD2P are planned in the administrative boundaries of City of Obrovac, and six turbines in the administrative boundaries of City of Benkovac (Figure 2-2).

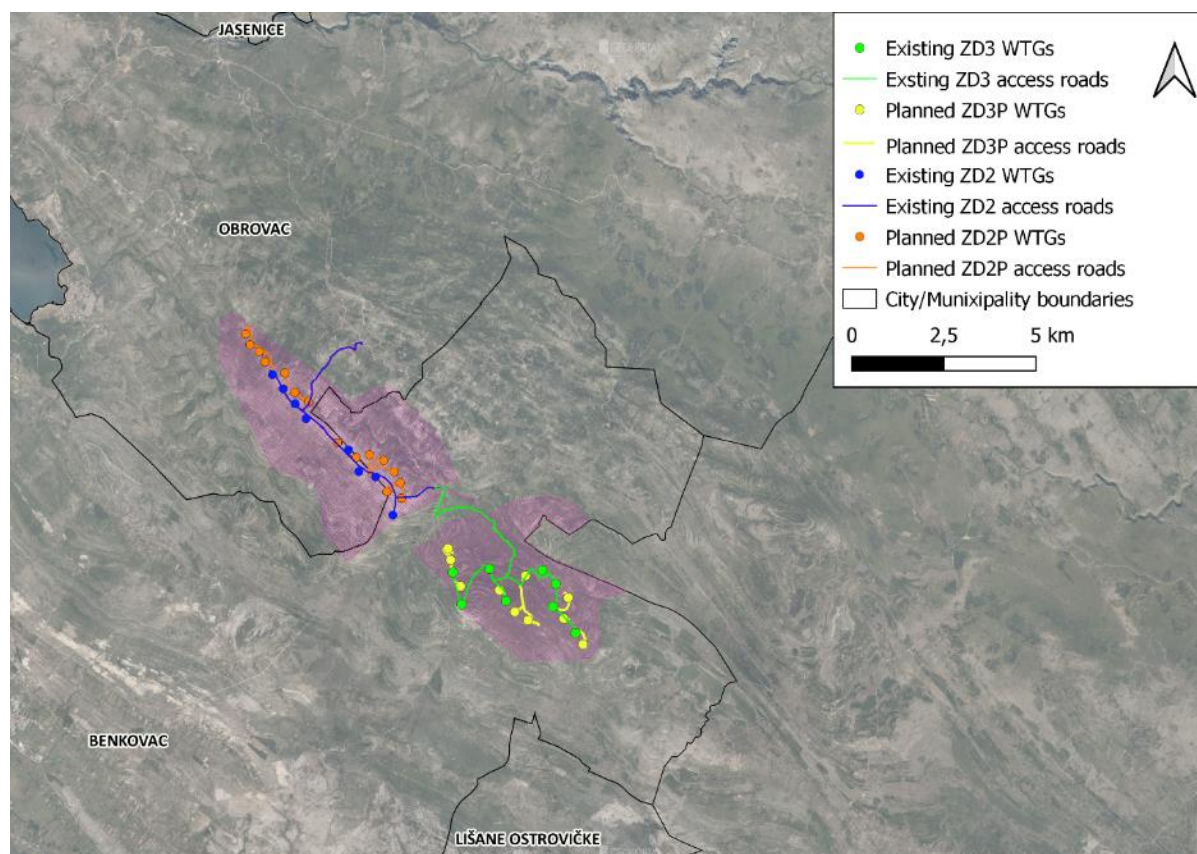


**Figure 2-1** Location of wind farms ZD2P and ZD3P in Zadar County

Location of WF ZD2P is within the area of existing WF ZD2 and ,1.7 km to the southeast, location of WF ZD3P is within area of existing WF ZD3 (Figure 2-2). Existing wind farms ZD2 and ZD3 have each eight wind turbines (Siemens SWT 2.3 MW) with total connected capacity of 18 MW and have been in operation since 2012.

Both windfarms are within the area designated by the Spatial Plan of Zadar County, Spatial Plan of Town of Benkovac and Spatial Plan of Town of Obrovac for the use of wind energy.





**Figure 2-2** Locations of the WFs ZD2P and ZD3P in relation to existing WF ZD2 and ZD3.

Area of the WF ZD2P is hilly, characterized by a relatively sparse population, with occasional areas of higher density (larger settlements) or low population density (small hamlets). Wind turbines will be laid in the northwest-southeast direction, parallel to the section of the Obrovac-Knin road, at an altitude between 620 m and 670 m and length of about 8 km.

The area is dominated by a natural landscape in the form of rocky grasslands and transitional areas of maquis and forests (Figure 2-3). Barren soil and lack of water have led to the restriction of agricultural land to sediments in valleys and sinkholes to which small settlements and hamlets are connected.



**Figure 2-3.** Location of the WF ZD2P (existing WF ZD2 to the right)

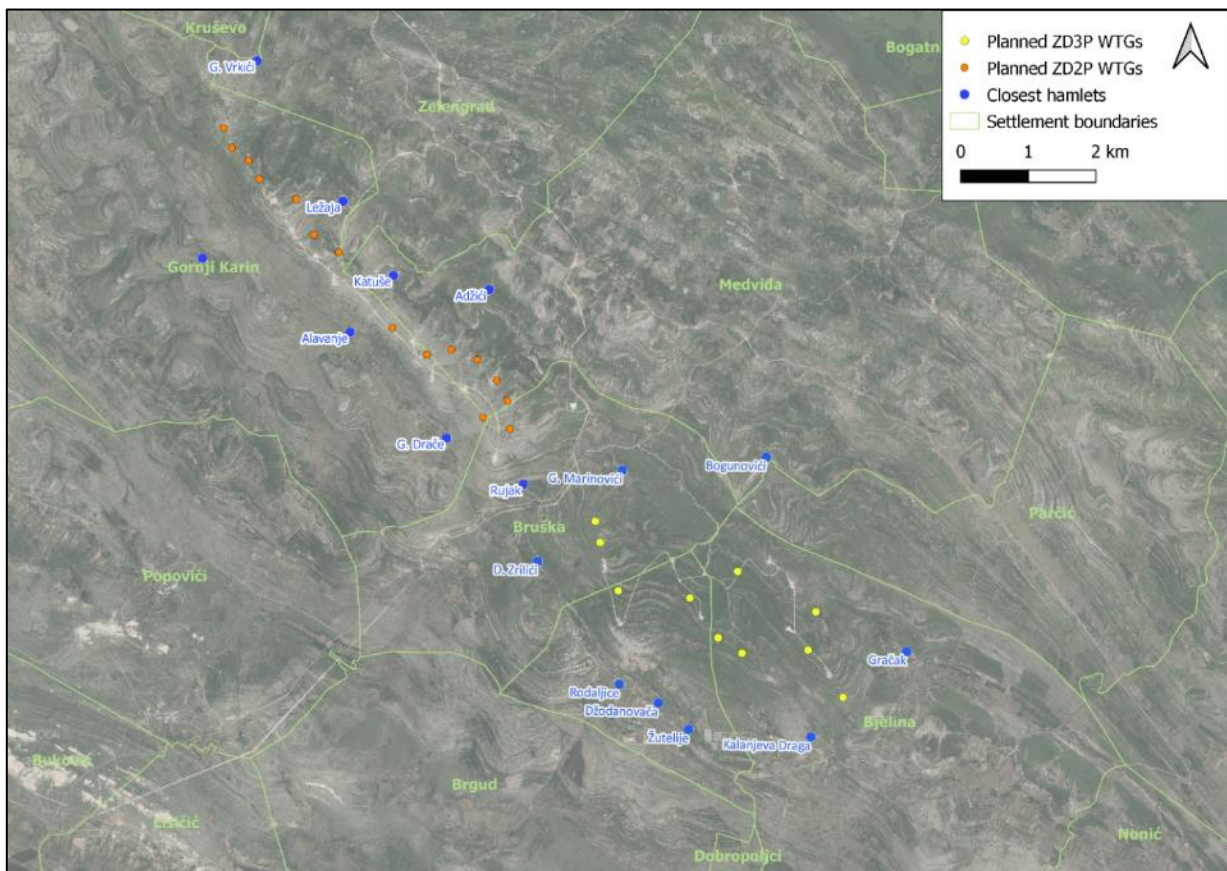


WF ZD3P will be located in the hilly area above the settlement of Rodaljice. The relief is limestone plateau laid in northwest-southeast direction, at an altitude of between 400 m and 550 m. Terrain is rocky mostly overgrown with dense lower vegetation. Wind turbines will be laid in the northwest-southeast direction.



**Figure 2-4.** Location of the WF ZD3P (existing WF ZD3)

The nearest areas of mostly uninhabited hamlets are located at more than 600 m from individual wind turbines of WF ZD2P and at more than 800 m from individual wind turbines of WF ZD3P. Closest hamlets are shown on Figure 2-5.



**Figure 2-5** Closest hamlets to the WFs ZD2P and ZD3P.

There are no surface water bodies in the wider area of the wind farms. Groundwaters bodies (JKGN\_07 - ZRMANJA and JKGI\_10 – KRKA) are both of good chemical and quantitative status.

Wind farms are planned outside of areas protected by Nature Protection Act (Official Gazette No. 80/13, 15/18, 14/19, 127/19) and away from NATURA 2000 sites. Distances to the closest NATURA sites are given in Table 2-1.

**Table 2-1** Distances to the NATURA sites

NATURA SITE	WF ZD2P	WF ZD3P
<b>Sites of Community Importance (SCI):</b>		
HR2001316 Karišnica and Bijela	3 km	11 km
HR2000641 Zrmanja River	7.5 km	11 km
HR2001375 The area around the cave Golubnjaca	6 km	4.8 km
HR2000089 Milića cave	7 km	8 km
HR200121 Benkovac	11 km	12 km
<b>Special Protection Areas (SPAs):</b>		
HR1000023 NW Dalmacija and Pag	5 km	12.5 km
HR1000022 Velebit	8.5 km	10.3 km
HR1000024 Ravni kotari	11.5 km	19 km
HR1000026 Krka i okolni plato	13.5 km	8.5 km

## 2.2. Project components

The wind farms configuration includes:

- Nordex DELTA 4000 wind turbine generators (WTGs) and associated operating plateaus,
- internal access roads to individual WTGs, 5 m wide, in a corridor up to 10 m wide,
- underground MV cable and distributive telecommunication canalisation (along access roads),
- electrical connection point in the existing substation TS 20/110 kV Bruska.

WF ZD2P will have 15 WTGs installed with total installed capacity of 68 MW and WF ZD3P will have 10 WTGs installed with total installed capacity of 53 MW. In line with the Electrical Connection Approvals, connected capacities are 68 MW for WF ZD2P and 43 MW for WF ZD3P.

According to valid environmental decisions and construction permits it is possible to install turbine model with rotor diameter up to 170 m and tip height up to 210 m. The selected Nordex DELTA 4000 WTGs fall within the maximum dimensions permitted under environmental decisions, location and construction permits.

The wind turbine typically consists of three blades around a rotor hub, connected to the main shaft which is spinning the generator to generate electricity by converting the wind's kinetic energy into electrical energy which can be fed to the electrical grid (Figure 2-6). Envisaged Nordex DELTA 4000 wind turbines are the newest generation of wind turbines with integrated flexible power rating which enables different application modes associated with specific ambient and wind conditions on the site and conditions in the transmission grid. Also, this feature allows to configure uniquely tailored solutions that meet site requirements, such as optimizing the operation of the wind farm in terms of capacity factor, achieving higher efficiency, WTG life extension and noise emissions.



**Figure 2-6** Wind Turbine (source: Platforms - Nordex SE (nordex-online.com))

Access to wind farms is provided by the existing access roads to WFs ZD2 and ZD3, while access to individual WTGs is provided via the existing internal access roads of the WFs ZD2 and ZD3, and by the new internal access roads which will be constructed and connected to the existing roads. Access roads and working plateaus are designed to adapt, as much as possible, to the characteristics of surrounding terrain, while avoiding deep cuts and backfilling.

All wind turbines will be connected by an internal cable network of 33 kV, buried at a depth of 0.80 m, which is laid along access roads. In addition to connecting wind turbines, the cable network will connect all wind turbines to TS 110/20/35 kV Bruška which is connected to the OHTL 110kV Obrovac-Benkovac. There is no need for additional 110kV OHTL network for connection from the existing substation to the 110kV transmission grid.

After the works are carried out, the area will be rehabilitated using the surface layer excavation.

### **3. PROJECT HISTORY, ADMINISTRATIVE PROCEDURES AND PERMITS**

WFs ZD2P and ZD3P were approved by relevant competent authorities, following EIA procedures with public engagement in 2014 and 2020 in accordance with national legal and permitting requirements.

Full EIA assessments for WFs ZD2P and ZD3P were carried out in 2014. Environmental impact studies were prepared by the authorized company. Within the procedure, the Appropriate Assessments of acceptability for NATURA 2000 sites were also carried out. Environmental decisions were issued in July 2014 with prescribed environmental protection measures and post-construction monitoring program.

In line with technological innovations and new knowledge about design and operation of wind turbines, Developer decided to introduce new type and capacity of WTGs. The original projects of WF ZD2P and ZD3P



were changed in 2019. Number of WTGs of WF ZD2P was decreased from 16 to 15. Capacity of all WTGs was increased and thus total capacity of each of the wind farms was increased by 20 MW.

Changes in the original projects were subject to Screening procedure in 2020 as well as Preliminary assessment of acceptability for the ecological network. Environmental reports were prepared for both wind farms by the authorized company. Environmental decisions were granted in October 2020 which stated that the full EIA procedure, as well as Appropriate assessment for of acceptability for the ecological network, were not needed. Mitigation measures and monitoring plan that had been determined during the EIA procedures in 2014 remained the same.

The EIA procedure was carried out in accordance with the requirements of the Directive 2014/52/EU and Habitats Directive. No shortcomings of the administrative EIA or planning procedures were identified. According to Environmental Protection Act, operation of wind farms is not subject to environmental permit.

Wind farms is now in pre-construction phase and all required approvals and permits to start construction are obtained.

Since the wind farms are located on the forest land owned by The Republic of Croatia, Agreement on easement on forests and forest land was signed with The Republic of Croatia for the purpose of construction and operation of WF ZD2P and ZD3P. The easement has been established for a period of 25 years.

Additionally, for wind farm ZD3P, small area of land was obtained though Agreements on easement signed with Zadar County Road Administration and with State Property Management Office.

Stakeholder engagement to date has focused to information disclosure and public consultations as a part of the EIA procedures. A Stakeholder Engagement Plan is developed with the aim to provide clear and practical guidance for stakeholder engagement and compliance handling procedures during the construction and operations of WFs.

## **4. CURRENT CONDITION OF EXISTING ENVIRONMENT AND SOCIO-ECONOMIC CONDITIONS**

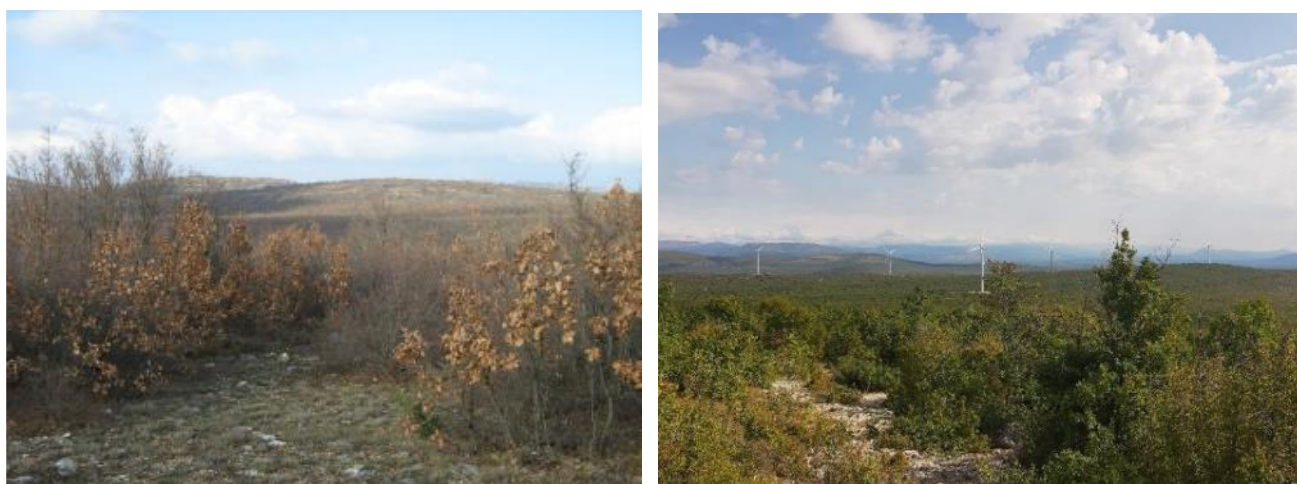
At the location of each future WFs and their WTGs, geological prospecting of the terrain was carried out. The depth profile on each location is approximately the same and consists of a surface scattered layer of rock about 0.5 m deep, below of which there is a relatively homogeneous layer of more compact rock mass. Based on the results of geostatic analysis, it was concluded that the foundation soil is geotechnically suitable for the WTG foundation.

The area surrounding planned WF ZD2P is sparsely vegetated. Historically this area was used for livestock breeding and grazing. Anthropogenic impact (livestock, deforestation) has left its mark in the form of strong degradation of the natural vegetation cover in which maquis and rocky grasslands predominate today (Figure 4-1).



**Figure 4-1.** Rocky grasslands at the WF ZD2P area

The surface cover at the WF ZD3P location consists mainly of shrubs (2 - 6 m high) on a rocky ground with rare occurrence of high vegetation. Various degradation forms of shrubs and bushes caused by uncontrolled deforestation, grazing, fires, etc. are common.



**Figure 4-2.** Shrubs at the WF ZD3P area

WFs are not located on agricultural land and in their wider area there are a lot of parcels registered as pastures. Besides the existing wind farm, there aren't any other similar activities nearby.

The description of the landscape features of the WFs locations and their impact on them was thoroughly analysed during the EIA procedures. The WFs area has already lost its landscape natural character due to the existing wind turbines of wind farms VE ZD2 and WF ZD3, which together with the access roads represent a strong anthropogenic element that visually dominates the narrower and wider area. The nearest villages and hamlets are in the lower areas on the side of the ridge. Hamlets are either desolate, or there are few houses present for occasional stay.

For the EIA procedures in 2014, in the period from 2012 to 2014, archaeological reconnaissance of the area surrounding WFs ZD2P and ZD 3P was carried out by the Zadar Archaeological Museum.

Results of reconnaissance in 2012 and 2013 for ZD2P determined eight (8) potential archaeological finds and sites identified which needed to be further researched and documented. The preliminary project design was modified in a way that micro locations of three WTGs were changed, and access roads routes were

adjusted. Additional field research was conducted in 2014 and no mobile or immobile archaeological finds were observed at the positions of all inspected WTGs as well as, on the associated access road routes.

Archaeological reconnaissance of the WF ZD3P area in 2012 recorded 42 localities of which 6 archaeological sites, 18 potential archaeological sites and 2 potential shepherd's shelters. In the 2nd amendment of the location permit for WF ZD3P, access road routes and wind farm plateau positions have been modified to avoid potential archaeological sites identified by the archaeological reconnaissance in 2012. Based on that Special Conditions issued by the Ministry of Culture, Conservation department in Zadar in May 2021, two potential archaeological sites remained at the positions of two wind turbines, WTG 14 and WTG 22 for which trial archaeological research should be undertaken before construction.

A chance finds procedure, will be implemented during the construction works, detailing specific actions to be taken in the event of unexpected archaeological discovery.

## 5. IDENTIFIED IMPACTS, MITIGATION MEASURES AND MONITORING

Environmental impacts were identified during the EIA procedures and additionally reviewed and analysed during the Environmental and Social Due Diligence.

### 5.1. Impacts during construction

#### 5.1.1. Flora and Habitats

The area of WF ZD2P and ZD3P belongs to the climazonal sub-Mediterranean plant association of *Quercus-Carpinetum orientalis*. It is a climazonal forest association of the northern Croatian coast, developed exclusively in the coastal area, while in the southern parts of the Croatian coast it develops deeper in the Dalmatian hinterland. Different degradation forms of shrubs and bushes caused by uncontrolled felling, budding, fires, etc. are much more common. The basic feature is the lack of differentiation (layering) between the layer of trees and shrubs.

Several habitat types were mapped in the wider area. Most present are C.3.5.1. Eastern Adriatic sub-Mediterranean rocky pastures followed by the E.3.5. Thermophilous deciduous Downy Oak woodland and D.3.4.2.3. Stands of sharp-needle pine (*Juniperus oxycedrus*).

However, the area affected refers to wind turbines with associated service areas and access roads which is estimated to be around 20 ha for ZD2P and 15 ha for ZD3P.

The EIA concluded that loss of 20 ha for ZD2P and 15 ha for ZD3P of dry grasslands and forests is considered negligible since these habitats are widespread. Mitigation measures during construction include the following:

- Access roads should be planned with a width of 5 m, except areas where it is not feasible and the road material should be gravel, not asphalt
- Disposal excavated material and waste in karts structures (caverns, sinkholes, estaveles...) or extraction of from them is forbidden.
- To reduce disturbance of habitat morphology and preserve autochthonous vegetation, construction works should be performed in the planned intervention zone with restricted movement of mechanization.

### 5.1.2. Bats

Possible impacts of the WFs ZD2P and ZD3P on bats were assessed during EIA and Appropriate Assessment procedures in 2014, Screening procedure in 2020, and Bat Fauna Monitoring conducted from June 2020 to May 2021.

Based on baseline bat research for WFs ZD2P and ZD3P (2012), post-construction bats monitoring results for existing WFs ZD2 and WF ZD3 (2012/2013 and 2013/2014) and bats monitoring for WFs ZD2P and ZD3P carried out in 2020/2021 it is concluded that bats from nearby important roosting sites and SCI sites do not use the WF ZD2P and ZD3P area for foraging or migrating. Bat fatalities at existing WF ZD2 and WF ZD3 were only occasional (5 fatalities in two years).

The monitoring was carried out using all standard methods according to the relevant guidelines (UNEP/EUROBATS 2014, SNH 2019), and impacts were assessed according to the same guidelines as well (SNH 2019). The original data on bat activity collected during the research from 2012 has since been updated with a new study in 2020/21, which has confirmed the original conclusions.

Based on the monitoring results so far, potential impact of WFs ZD2P and ZD3P on bats was assessed as not significant and due to low bat activity, the risk is unlikely to change.

Mitigation measures during construction were prescribed and are as follows:

- Lights which do not attract insects (i.e., bats) have to be used on construction site.
- In case of finding a bat roost, it must not be disturbed or destroyed.

### 5.1.3. Birds

Impacts of the WFs ZD2P and ZD3P on birds were assessed during EIA and Appropriate Assessment procedures in 2014 and Screening procedure in 2020. Wind farms ZD2P and ZD3P are planned on the same locations where the existing WFs ZD2 and ZD3 operate. This area has previously been the subject to several studies of bird fauna in relation to the potential impact of wind turbines. For the assessment of potential on birds of the WF ZD2P and ZD3P results of the following field surveys was used:

- one-year field surveys of bird fauna conducted as part of the EIA procedure for the construction of WF ZD2 and ZD3 (July 2007 - June 2008)
- the two-year post-construction monitoring of birds after commissioning of WF ZD2 and ZD3 which was prescribed by the environmental decision (April 2012 - April 2014)
- additional one-year monitoring of birds initiated by the Developer in the area of existing WFs ZD2 and ZD3 (including planned WF ZD2P and ZD3P) (May 2020 - April 2021).

Continuity in birds monitoring in area has significantly helped in making appropriate conclusions about the assessed impacts and recent monitoring in 2020/2021 has further corroborated the results of previous research.

Monitoring was conducted by independent national experts (ornithologists) and in line with the international guidelines (SNH guidelines 2009, 2017).

Monitoring of bird's population conducted so far, show a stable trend of all populations of birds in wider area of WFs. No birds' fatalities (collision) were recorded as well as any other potentially significant negative impacts.



In 2020, collision risk was calculated for both wind farms using a standard Band model that follows Scottish Natural Heritage (SNH) guidance. Results of risk collision modelling showed that with the assumed avoidance rate of 99 % no bird fatalities due to collisions is expected.

Measures to be implemented during construction, prescribed by the environmental decision, are:

- Ends of blades must be coloured red or black and/or UV colours in order for blades to be more visible, especially for raptors.
- In the case of finding a nest of strictly protected birds, prevent any damage or disturbance especially in the breeding season, and inform the authorities about the raptor nests. If construction work is necessary for continuation of the project, permits must be authorized.

Based on the ESDD additional measures include:

- Works on vegetation removal should be carried out before the start of the nesting season. Otherwise, an expert (ornithologist) should be engaged to conduct thorough survey and assessment of the construction area and to determine the possible presence of active nests.
- If nests are found, further work should be carried out according to the ornithologist's instructions aimed to avoid disturbance and to help ensure works proceed in compliance with the legislation protecting nesting birds.
- Ornithologist should check the area in March for active raptor birds' nests and if one is present postpone the construction work 100 m around the nest until July.

ESDD confirmed that with implementation of prescribed mitigation measures, risk of impacts on birds is low.

### **5.1.4. Soil and groundwater**

While there are no sensitive receptors in the wider area, contamination of the soil and groundwater may potentially occur during construction, mainly by accidental leakage of harmful substances (oil, fuel) from machinery and transport. During construction and operation of wind farms no technological wastewater will be produced. Water will be used only for sanitary purposes during construction.

No permanent changes in soil and land will occur. After the construction of the WTG foundations and underground cables, the soil will be brought back to its original function. Access roads will be made from natural materials.

Prescribed mitigation measures are:

- On the construction site determine areas for temporary storage and disposal of excavated material and parking lots for vehicles and machines.
- Take measures to protect the soil from oil contamination with oily liquids in the parking lot.
- Fuel tanks for the needs of the construction site should be placed in secondary containment or made with a double wall.
- Use the excavated earth material for construction and rehabilitation.

### **5.1.5. Air quality**

The EIA considered air emissions as insignificant to the environment. Additionally, the dust emissions will be short-term. It is expected that there will be no exceedance of air quality standards. ESDD recommended to wet surfaces during the construction to prevent dust spreading.

### **5.1.6. Waste**

Waste generation during construction will occur. The possible types of waste have been mapped in the EIA. Waste generated will be temporarily stored at special area and delivered to authorised companies. Location for temporary storage of waste will be defined during drafting the Construction Site Development Plan. ESDD additionally recommended Waste Management Plan to be developed for the construction phase.

### **5.1.7. Noise**

Noise of higher intensity will occur during construction as a result of machinery, transport and drilling. This impact is temporary, short-term and local in nature. The impact ceases after the works are performed and no significant negative impact from noise emission values is expected. To limit nuisance in the area, construction works will be performed during the daytime only. ESDD confirmed risk of impact of construction noise to be low as it is of temporary nature.

### **5.1.8. Landscape**

According to EIA the construction will have moderate impact on the landscape and visual characteristics. The Landscaping Project was developed as a part of main project design and included measures for conservation, reconstruction, and rehabilitation of the project area after the construction.

After the construction is finished the landscape architect should visit the wind farm sites to determine the exact measures and the manner of carrying out the remediation prescribed by the landscaping project.

### **5.1.9. Traffic**

Ways and routes of transporting wind turbines to the construction site were addressed during EIA. The preliminary Transport Survey was prepared in July 2020 and included observations on the access route and transportation of the key components to the WF sites. The Survey concluded that certain road modifications required to enable the delivery of key components to the site are of rather low extend.

The impact on traffic during the construction phase of the project has not been addressed through environmental documentation (EIA and Screening).

During transport, there will be an impact on road traffic. For the entire length of the route, it will be necessary to obtain a permit for extraordinary transport in accordance with the Ordinance on extraordinary transport (Official Gazette No. 92/2018). This will lead to a slowdown in normal traffic and in some parts (especially intersections) it will be necessary to provide temporary special traffic regulation.

The Traffic management Plan will be developed and implemented to manage the project traffic and potential health and safety risk and disturbance impacts. Required permits will be secured in advance for all necessary activities.

### **5.1.10. Health, Safety and Labour**

The construction contractors will be required to implement national, and Lender's requirements related to the management of health and safety and labour and working conditions. Construction workers can be exposed to number of potential health and safety risks including working at height, working with electricity, heavy lifting operations.

The construction contractors will be required to develop Environmental Health and Safety Plan which will be monitored by the Company. The contractors of major works will be required to have grievance procedure in place for receiving, recording answering and facilitating resolution of workers' concerns.

## **5.2. Impacts during operation**

### **5.2.1. Birds and bats**

Assessment carried out concluded that impacts on birds and bats during operational phase of WFs are not expected. Additionally, during the pre-construction phase, an expert (ornithologist) should be engaged to conduct thorough survey and assessment of the construction area and to determine the possible presence of active nests.

In case the post-construction monitoring results show significant bat mortality, mitigation measures (such as blade feathering, increase of cut-in wind speed) will be introduced. If mitigation measures are to be implemented, additional monitoring should be carried out to assess their efficiency.

Based on the Band collision risk model results, low probability of high mortality rates of birds is expected. To protect birds from collisions during night, minimal light should be used that is in line with safety measures for air traffic. Night light should be yellow or red flickering light with periodic on and off. The two-year post-construction monitoring was prescribed by the environmental decision. If the results of operational monitoring show the Project, i.e., individual wind turbines, have a negative impact on the ornithofauna, in agreement with the body responsible for nature protection, operating regime will be harmonized by adjusting and/or limiting the operation of wind turbines during peak activity (autumn and spring migrations as well as daily migrations to the hunting habitat).

### **5.2.2. Waste**

During operation and maintenance of the wind farms small amounts of waste will be generated. Waste will not be stored on site but delivered to authorized companies for further management.

### **5.2.3. Accident Hazards**

The fall of the wind turbine is the potential accident of the most serious consequences. To reduce a related risk for humans and goods, the turbines are located away from the sensitive areas, in a distance exceeding maximum height of the entire turbine (including the rotor blades).

Preventive measures were integrated during project design, by leaving a sufficient distance between the wind turbines and securing the protection zone between the wind turbines and other infrastructure facilities in the vicinity. Additional safety measures are provided by strength and static calculation of foundation and equipment during development of the design documentation.

WTGs are equipped with optical smoke sensors and lightning protection system. All transformers are equipped with oil pits. The operation of each wind turbine is monitored by WPS (Wind Power Supervisor) and TCM (Turbine Condition Monitoring) systems. Each of the WTGs has Safety Card Booklet which is available on the ground floor and in the gondola.

The contractors will develop Emergency Preparedness and Response Plan with clearly defined roles and activities in case of emergency.

#### **5.2.4. Noise**

To assess noise impact, a numerical modelling of noise distribution was conducted for both planned wind farms as part of EIA procedure in 2014 and Screening procedure in 2020.

The calculation results showed that the noise levels that will occur will be lower than the maximum allowed for daytime, while during the night-time, at maximum noise emission in the defined operation mode, at two reference points, for WF ZD2P, noise levels may be around the allowed limit values. Planned WTGs can be operated with reduced noise emission, which together with positive noise distribution calculation results should secure the noise standards to be kept at sensitive areas.

After the Project is commissioned, noise measurement at the reference points will be carried out according to the determined monitoring programme. Based on the measurement results, the operating conditions in the mode with reduced noise emission should be analysed and corrected if necessary.

#### **5.2.5. Electromagnetic fields**

During the design phase calculation of low-frequency electric and magnetic field levels was conducted.

The calculation showed that expected levels of electric and magnetic fields in normal operation are far less than the limit values prescribed by the Ordinance on protection against electromagnetic fields (Official gazette No. 59/16).

Additional low-frequency electric and magnetic field measurements will be conducted after the commissioning of the wind farm.

#### **5.2.6. Flickering**

The shadow flicker effect is caused by the shadows that are given off by wind turbines when they are in full rotating motion. There are no flicker regulations in Croatia that project needs to adhere to.

Distances of individual wind turbines from settlements range from 600 m to 1.700 m. There are no evident sensitive receptors on site like school buildings, hospitals, nursing homes, day caring institutions and no permanently occupied dwellings within range of the 500 - 700 m where the shadow flicker has the most pronounced effect. Analysis of the Project location, distances to and locations of closest hamlets, presence of sensitive receptors, experience from the operation of existing WFs ZD2 and ZD3 shows that shadow flicker effects will not exceed the minimum allowable per sensitive receptors so no potential hours for curtailment are expected.

Real case flickering model will be conducted during operation of wind farms and based on the results, if necessary, mitigation measures will be applied.



## 5.2.7. Cumulative impacts

Cumulative impacts on the environment are the result of multiple activities whose individual direct impacts may be relatively minor but in combination with others result are significant environmental effects.

Cumulative impacts of WFs ZD2P and ZD3P was assessed and covered existing and planned similar projects in wider area. The main criteria included:

- Projects are planned by the valid spatial planning documentation
- The EIA or Screening procedure was carried out and environmental decision obtained
- Similar projects included renewable energy sources (wind farms, solar power plants), and overhead transmission lines.
- Buffer zone analysed is 15 km.
- Impacts on bats and birds, habitats loss, land use, noise and landscape were assessed.

The area of Zadar County has significant potential for the use of renewable energy sources. Currently wind energy is mainly used. In the wider area of the Project, there are several wind farms already in operation as well as some that are planned (Table 5-1, Figure 5-1) So far, no solar plant have been built, but there are several planned (Table 5-2, Figure 5-1).

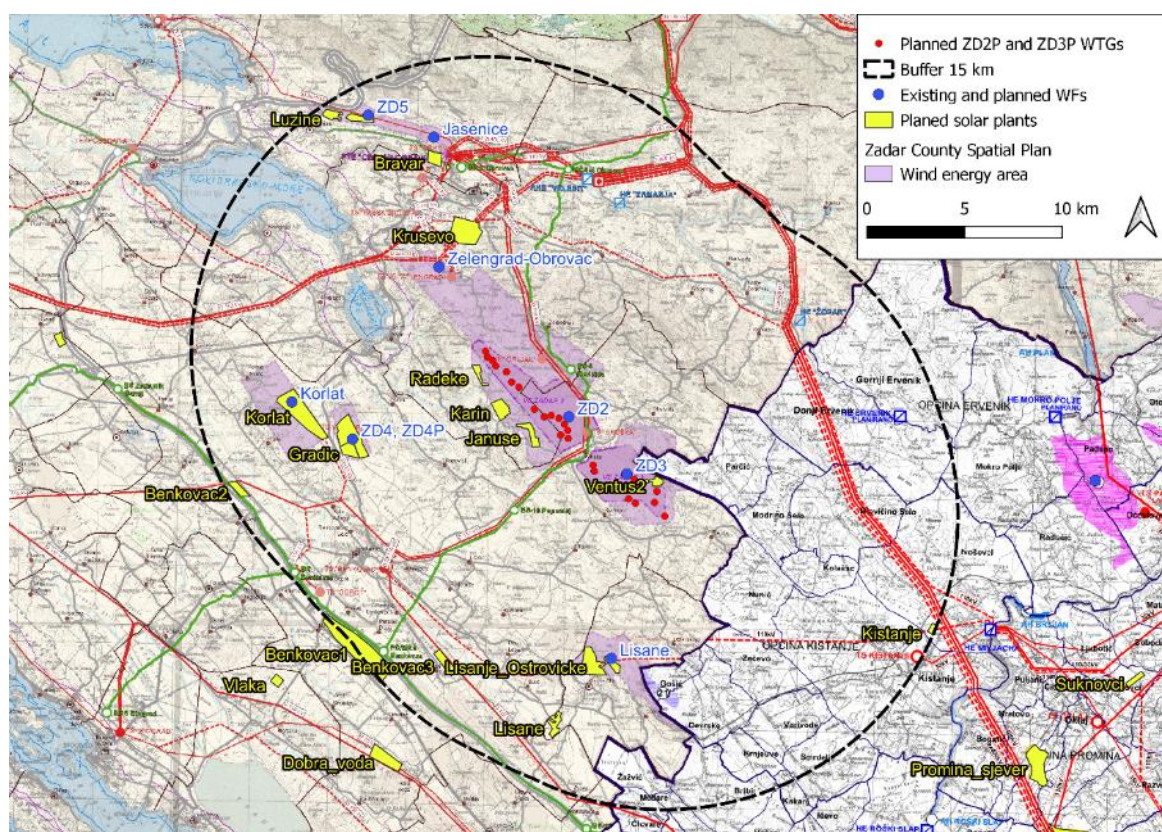
**Table 5-1.** Existing and planned wind farms within the radius of 15 km

Wind farm	No. of WTG	Total installed capacity (MW)	Existing/Planned	Distance to ZD2P	Distance to ZD3P	Environmental decision
WF ZD2	8	18.4	existing (since 2012)	at the same location	1.7 km to NW	Yes (approved)
WF ZD3	8	18,4	existing (since 2012)	1.7 km to SE	at the same location	Yes (approved)
WF ZD3P	10	53	planned	1.7 km to SE	-	Yes (approved)
WF ZD4	4	12	existing (since 2014)	8 km SW	10 km NW	Yes (approved)
WF ZD4P	4	24	planned	8 km SW	10 km NW	Planned (in procedure)
WF ZELENGRAD-OBROVAC	14	42	existing (since 2015)	3 km to NW	11 km NW	Yes (approved)
WF KORLAT	18	63	existing (since 2021)	10 km to SW	13 km to NW	Yes (approved)
WF JASENICE	5	10	existing (since 2020)	10 km NW	-	Yes (approved)
WF ZD5	3	20	planned	12 km NW	-	Planned (in procedure)

**Table 5-2** Planned solar plants within the radius of 15 km

Solar plant	Total power (MW)	Area (ha)	Distance to the ZD2P	Distance to the ZD3P	Environmental decision
JANUSE	25	15	800 m SW	3 km NW	Yes (approved)
RADEKE	25	15	900 m SW	7 km NW	Yes (approved)
KARIN	30	15,5	1 km SW	5 km NW	Yes (approved)
VENTUS	20	26.5	4.5 km SE	within the area	Yes (approved)

Solar plant	Total power (MW)	Area (ha)	Distance to the ZD2P	Distance to the ZD3P	Environmental decision
KRUSEVO	17	47	6 km NW	13 km NW	Yes (approved)
KULA	70	143	8 km SW	12 km NW	Yes (approved)
GRADIC	9,9	36	8 km SW	12 km NW	Yes (approved)
KORLAT	75	145	9 km SW	13 km NW	Yes (approved)
BRAVAR	44	37	10 km NW	-	Planned (in procedure)
LISANE OSTROVICKE	49	31.7	10 km SE	8 km SW	Yes (approved)
BENKOVAC3-KOLARINA	9.99	6.04	12 km SW	11 km SW	Yes (approved)
BENKOVAC3	30	20	12 km SW	11 km SW	Yes (approved)
LUZINE	19,9	12	13 km NW	-	In procedure (proposed)
RUPINE	19,9	12	13 km NW	-	Planned (in procedure)
BENKOVAC2-RASTEVIC	9,99	5.98	14 km SW	-	Yes (approved)
BENKOVAC2	20	12.3	14 km SW	-	Yes (approved)
LISANE	32	45.9	14 km S	11 km SW	Yes (approved)
BENKOVAC1	9.99	6,01	14 km SW	15 km SW	Yes (approved)
BENKOVAC1	60	39	14 km SW	15 km SW	Yes (approved)



**Figure 5-1** Existing and planned near-by projects (windfarms and solar plants)

The closest to the location of the Project are the existing overhead transmission lines (OHTL) 110kV Obrovac-Benkovac-Korlat-Zadar and 110kV Obrovac-Bruška-Benkovac.

Besides wind farms, solar plants and transmission lines, there are no other existing or planned activities in the area.

Possible cumulative impacts of wind farms and solar plants arise primarily due to conversion, i.e., habitat occupation, which, depending on the location and configuration of the terrain, also cause habitat fragmentation.

Closest planned solar plants are JANUSE, RADEKE, KARIN and VENTUS. Altogether these solar plants have footprint of around 70 ha and will additionally cause habitat occupation. Since the habitats that predominate in the area are widely spread, habitat loss is considered low.

Based on the results of monitoring carried out so far in the area of planned windfarms, due diligence confirmed that bats from nearby important roosting sites and NATURA SCI sites do not use the area of the wind farms for foraging or migrating thus no cumulative impacts is expected.

Susceptibility to cumulative impacts of wind farms is particularly pronounced in populations of birds whose individuals or pairs have large areas of movement, their population is not large, and the species faces habitat loss from other sources. These characteristics are primarily related to raptor birds.

Cumulative impacts on birds were assessed during the Appropriate Assessment in 2014, within Screening procedure in 2020 and additionally during the environmental and social due diligence. Assessment included potential cumulative impacts of WFs ZD2P and ZD3P with existing wind farms ZD2, ZD3, ZD4 and Zelengrad and planned wind farm ZD4P. For each wind farm low, medium and high impact zones were determined.

Results of monitoring on existing WFs ZD2 and ZD3 and observations of birds' activity throughout the day have shown that birds generally avoid the immediate area around WTGs. If they fly near wind turbines, which is a rare case, they do it below the height of rotor blades and rarely above.

Medium impact zone of WFs ZD2P and ZD3P (area within 1.5 km around the wind farms area) is dominated by rocky habitats with here and there oak - white hornbeam bushes and shrubs, which are generally not suitable habitats for birds of prey.

Analysis of impact zones overlapping indicates that small overlaps occur in the medium impact zones of the two nearest wind turbines of WF ZD2 and WF ZD3P and low impact zones of the two nearest wind turbines of WF ZD2P and WF Zelengrad. Area of overlapping between WFs ZD2 and ZD3P is a valley about 1.7 km wide, while a that between WF ZD2P and WF Zelengrad is around 3 km wide. Therefore, areas leave enough space for unobstructed communication and flight.

Total land used for planned WF ZD2P and ZD3P and planned solar plants will be around 100 ha. Like WF, solar power plants are not planned on land suitable for agriculture and grazing and sufficient land in the area will remain for possible grazers.

Due to the horizontal position and distance from roads and the nearest populated areas, visibility of solar plants will be low and will not contribute to increasing the dominance of anthropogenic elements already present as WTGs and further impair landscape quality.

No cumulative effects on noise levels are expected. Noise impact of planned WFs ZD2P and ZD3P was modelled and calculated and included existing WTGs of WFs ZD2 and ZD3. Results show that the noise levels at reference points (closest hamlets) will be lower than maximum allowed. None of the closest hamlets is at a distance at which it could be exposed to the cumulative impact of noise i.e., increased noise levels resulting from the operation of both wind farms.

In conclusion, environmental and social impacts from planned WF ZD2P and ZD3P, combined with the potential impacts resulting from proposed and/or planned future developments, will not result in significant cumulative impacts that would not be expected in the case of a stand-alone development.

### **5.3. Post-construction monitoring**

Post construction monitoring program for WF ZD2P and ZD3P is prescribed by the environmental decisions and ESAP.

After the wind farm is put in operation, noise levels should be measured. If the acoustic levels are exceeded, mitigation measures should be taken to lower noise levels to allowed threshold. Noise measurement is repeated every three years and additionally if new equipment is installed.

Environmental decision contains a detailed two-year post-construction monitoring program with regards to birds and bats after the wind farm has been put in operation. The Company will develop detailed monitoring protocol with defined methodology in line with international guidelines and activities to be performed during the monitoring. The Company will also report to environmental authorities in line with the requirements stipulated in the decisions.

## **6. ENVIRONMENTAL AND SOCIAL MANAGEMENT SYSTEM**

Different entities will be involved in the construction and operational phase of the WFs ZD2P and ZD3P. The Company will have separate contracts for construction, turbine supply, operation & maintenance, and commercial services while the Developer will provide management and supervision of all activities. Contractors will be required to adhere to national laws and good practice and all requirements will be defined and included in contract documents.

The Company has not implemented any environmental or health and safety management system yet. Although all tasks related to construction and then operation of the wind farm will be outsourced ESDD recommended for the Company, to develop appropriate environmental and social management system (ESMS) for the Project. The ESMS will incorporate environmental and social policies, procedures, plans with mitigation measures and will be applied during the construction and operation of WFs ZD2P and ZD3P.

Stakeholder Engagement Plan (SEP) is developed to ensure timely and effective sharing of information and communication with stakeholders related to the WFs ZD2P and ZD3P. SEP also includes grievance mechanism to manage grievances submitted by stakeholders. All grievances will be registered in a grievance database.

Environmental and Social Action Plan (ESAP) has been developed for WFs ZD2P and ZD3P to address risk related to construction and operation stage impacts and contains requirements and commitments including mitigation measures as specified in environmental decision and recommendations from the ESDD.



## 7. FURTHER INFORMATION

All requests for additional information related to the Wind farms ZD2P and ZD3P can be addressed to:

Kunovac d.o.o.

Jurišićeva 1a, 10000 Zagreb

Tel: 01 4693 040

e-mail: [iljko.curic@vjetroelektrane.hr](mailto:iljko.curic@vjetroelektrane.hr)

