NON-TECHNICAL SUMMARY

To Environmental Impact Assessment Report of an Investment Proposal for

„Construction of seven wind turbines and modification of their technical characteristics in the villages of Gorichane and Prolez, Shabla Municipality“

Client: NIMEKS-2004 EOOD – Varna

December 2022

1. Overview

1.1. Description of the Investment Proposal

This Non-technical Summary of the EIA report is a further revision of an investment proposal with the original title:

„*Construction of 20 Wind Turbines" on land plots with identification numbers: 58596.9.52, 58596.10.69, 58596.10.71, 58596.11.157, 58596.13.202, 58596.14.57, 58596.9.52 on the land of Prolez village, Shabla Municipality, and land plots with identification numbers: 16095.14.187, 16095.14.183, 16095.14.193, 16095.14.185, 16095.14.191, 16095.14.189, 16095.14.181, 16095.15.130, 16095.16.72, 16095.14.72, 16095.18.218, 16095.18.222, with a separate road with identification number 16095.18.224, 16095.18.220, 16095.28.134 on the land of Gorichane village, Shabla Municipality.*

The investment proposal has initiated the procedure of environmental impact assessment by Decision **№BA 314-PR/02.10.2009** of the competent authority Regional Inspectorate of Environment and Water - Varna (RIEW), the implementation of the investment proposal has been approved by Decision №**BA-11/21.11.2011** (Appendix 1) of the competent authority RIEW - Varna, with the following technical parameters of the wind turbines:

- rated power up to 3.0 MW
- tower height up to 105 m
- rotor diameter up to 93 m

A long process of quality assessment of the EIA and Compatibility Assessment reports followed, with a file at the RIEW- Varna under No. 26-00-3468. Throughout the years, the client has strictly adhered to and complied with all permitted parameters, deadlines, guidelines and instructions of the competent authority.

At present, wind turbines with already approved parameters are out of date and are not in production. The global trend in the range of products offered by manufacturers is towards an intensive increase in the unit power of the equipment, i.e. an increase in its efficiency. Higher technical parameters enable more complete and efficient conversion of wind energy into electricity.

In order to meet current market requirements and due to new circumstances and needs, the client has decided to implement the project with **a new generation of wind turbines with higher technical parameters than those approved**, but in order not to further increase the environmental impact, **the scope of the investment proposal will be reduced by reducing the number of turbines originally requested from 20 to 7**, thus reducing the coefficient of directly affected areas.

The scope of the investment proposal is reduced and amended to:

„Construction of seven wind turbines and change of their technical characteristics – tower height up to 125 m, rotor diameter up to 163 m, power up to 8 MW" - on land plots with identification numbers: 58596.11.157, 58596.14.57 on the land of Prolez village, Shabla Municipality, and land plots with identification numbers: 16095.14.193, 16095.14.189, with a separate road with identification number 16095.14.191, 16095.16.72, 16095.18.222, ith a separate road with identification number 16095.18.224, 16095.28.134 on the land of Gorichane village, Shabla Municipality.

The revision concerns both the EIA report and the report on the assessment of compatibility with the subject and objectives of the protected areas in the area adjacent to the investment proposal, following all the instructions of the competent authority throughout the EIA procedure and in accordance with the latest letters of RIEW - Varna (Appendix 1):

- ref. 26-00-3468/A29/03.06.2019

with a negative assessment of the quality of the EIA and Compatibility Assessment report with detailed

instructions and guidelines for revision.

- ref. 26-00-3468/A41/08.11.2021

Due to a declared new change with a reduction in the number of wind turbines and the need to collect new data within the scope of 7 wind turbines, the competent authority provides further instructions and guidelines for the submission of revised quality assessment reports by 30.12.2022.

- ref.26-00-3468/A43/01.04.2022

Following the submission of an avifauna monitoring study plan for 7 wind turbines, the competent authority provides instructions and guidelines for the continuation of the EIA process.

The scope, parameters and content of the EIA report will be determined on the basis of the latest letter from the competent authority RIEW - Varna, in accordance with the instructions contained therein. The EIA has been prepared on the basis of stakeholder consultations in relation to the new parameters and organisations, taking into account the requirements of:

1. The national legislative framework;
2. Environmental and Social Policy, April 2019, of the European Bank for Reconstruction and Development;
3. Guidelines for the Protection of Wild Birds in the Development of Wind Energy Sources in Bulgaria, 2013, ECONNECT;
4. Bats: Methodology for Environmental Impact Assessment and Compatibility Assessment - Handbook for developers and environmental experts, 2008, National Museum of Natural History - Bulgarian Academy of Science;
5. Guidelines for consideration of bats in wind farm projects, updated 2014, EUROBATS issue 6.

1.2. Client's Details

Client under the investment proposal:

„**NIMEKS-2004" EOOD, UIC 131198809,** with seat and registered office: Varna -9002, Primorski region, 76 General Kolev Str., fl.3, apt.6, UIC 202670268, with Managers Stanislav Gochev and Kenneth Lefkowitz (Appendix 2)

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„**NIMEKS-2004" EOOD** is the client as the holder of all rights and permits in connection with the construction of the Prolez wind farm pursuant to a notarised Agreement on Sale and Purchase and Assignment of the Project for the Construction of a Wind Farm with WPP Prolez EOOD dated 28 July 2021 (Appendix 3).

„**NIMEKS-2004" EOOD** owns the land, holds the property rights and is authorised to construct wind turbines. (Appendix 4).

1.3. Location of the site, description of the current situation, neighbours and distances (map of the area)

The wind farm is a complex of a total of 7 wind turbines, transformers, underground cables, access roads, technological sites and a substation.

The sites for the wind turbines, in the new reduced scope, will be located on already developed land, no new sites will be used.

The new scope of the investment proposal will include 7 turbines on the following properties:

Prolez village:
1) 58596.14.57 (previous identification number 58596.14.55)
2) 58596.11.157 (previous identification number 58596.11.142)

Gorichane village
3) 16095.18.222 (previous identification number 16095.18.199) with a separate road in land plot 16095.18.224
4) 16095.28.134 (previous identification number 16095.28.130)
5) 16095.14.193 (previous identification number 16095.14.169)
6) 16095.14.189 (previous identification number 16095.14.164) with a separate road in land plot 16095.14.191
7) 16095.16.72 (previous identification number 16095.16.65)

Detailed information on ownership, established rights and pre-contracts related to the construction of wind turbines is presented in Table 1 (Appendix 4).

WPP Prolez

WT No.	Previous plot number	New plot number								
		Urbanized	Area, m2	Owner	Vested rights	Document	Agricultural	Owner	Vested rights	Document
1	58596.14.55	58596.14.57	2 540.00	Agroal	NIMEKS right to build	TD 143/22.07.2021	58596.14.69	Nimeks		TD of 22.12.2022
6	58596.11.142	58596.11.157	699.00	SkarTepe	NIMEKS right to build	TD 143/22.07.2021	58596.11.162	Nimeks		TD of 22.12.2022
8	16095.18.199	16095.18.222	532.00	NIMEKS		TD 63/24.08.2022				TD of 22.12.2022
road	16095.18.200	16095.18.224	1378.00	NIMEKS		TD 63/24.08.2022				
16	16095.28.130	16095.28.134	657.00	Individual - A.A.	Preliminary agreement for right to build and right to use	No. 3873/ 16.11.2022	16095.28.135	Individual - A.A.	Preliminary agreement for right to build and right to use	No. 3873/16.11.2022
17	16095.14.169	16095.14.193	3113.00	Individual - R.U.	Preliminary agreement for right to build and right to use	No. 3503/ 19.10.2022	16095.14.194	Individual - R.U.	Preliminary agreement for right to build and use	No. 3503/19.10.2022
road		16095.14.191	2845.00	Individual - Zh.Zh.	NIMEKS right to build	TD 143/22.07.2022				
19	16095.14.164	16095.14.189	3938.00	Individual - G.Zh.	Preliminary agreement for right to build and right to use	No. 3370/07.10.2022	16095.14.190	Individual - G.Zh.	Preliminary agreement for right to build and right to use	No. 3370/07.10.2022
22	16095.16.65	16095.16.72	604.00	Individual - A.A.	Preliminary agreement for right to build and right to use	No. 3872/16.11.2022	16095.16.73	Individual - A.A.	Preliminary agreement for right to build and right to use	No. 3872/16.11.2022

Table 1

At the request of some of the landowners, the conditions were updated and renegotiated with preliminary agreements for the establishment of the right to build and the right to use from 16.11.2022 and with notarised powers of attorney giving Nimeks-2004 EOOD the right to represent the owners in all administrative procedures related to the construction of wind turbines.

When selecting specific points for wind turbines, the requirements for ensuring their efficient operation have been taken into account and complied with, in accordance with Articles 141, 141a and 142 of Regulation No. 14 of 2005 on technical rules and regulations for the design, construction and use of sites and installations for the generation, conversion, transmission and distribution of electricity; distances from populated areas; distance between generators; foundations; their location and noise.

Table 2 Parcel numbers and distance from towns and villages

No	**WT No.**	**Previous plot number**	**New plot number/ urbanized**	**Distance in m**
1	1	58596.14.55	58596.14.57	1262 southwest of Prolez, Statement No. 1912/7.4.09
2	6	58596.11.142	58596.11.157	1275m south of Prolez, Statement No. 4584/19.08.08
3	8	16095.18.199	16095.18.222	1777 north of Gorichane, Statement No. 7167/2.12.08
4	16	16095.28.130	16095.28.134	2260 north-west of Gorichane, Statement No. 7195/2.12.08
5	17	16095.14.169	16095.14.193	2112 north-west of Gorichane, Statement No. 1102/11.3.09
6	19	16095.14.164	16095.14.189	2020 northwest of Gorichane, Statement No. 1101/11.3.09
7	22	16095.16.65	16095.16.72	1035 north of Gorichane, Statement No. 7164/2.12.08

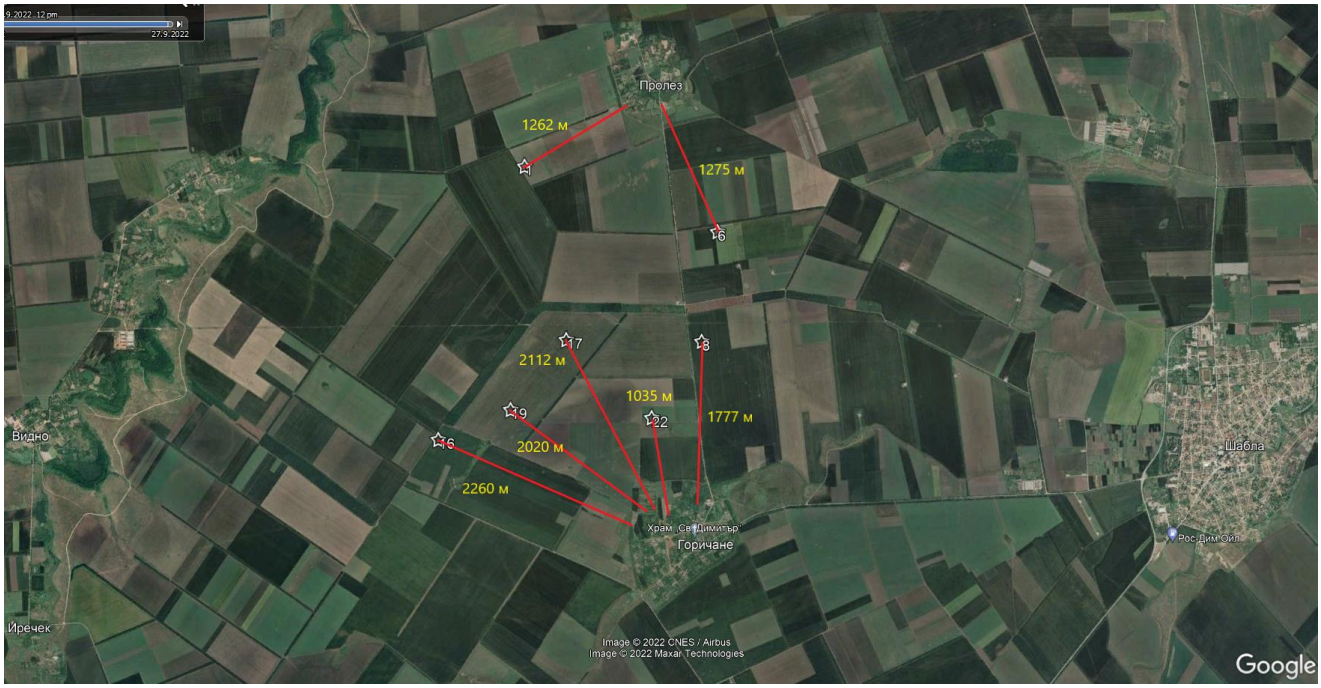

Figure 1.1 shows a detailed, up-to-date map of the wind farm location in the new, reduced scope and technical infrastructure - the route of the road connections coincides with the cable routes outside the sites (Appendix 6):

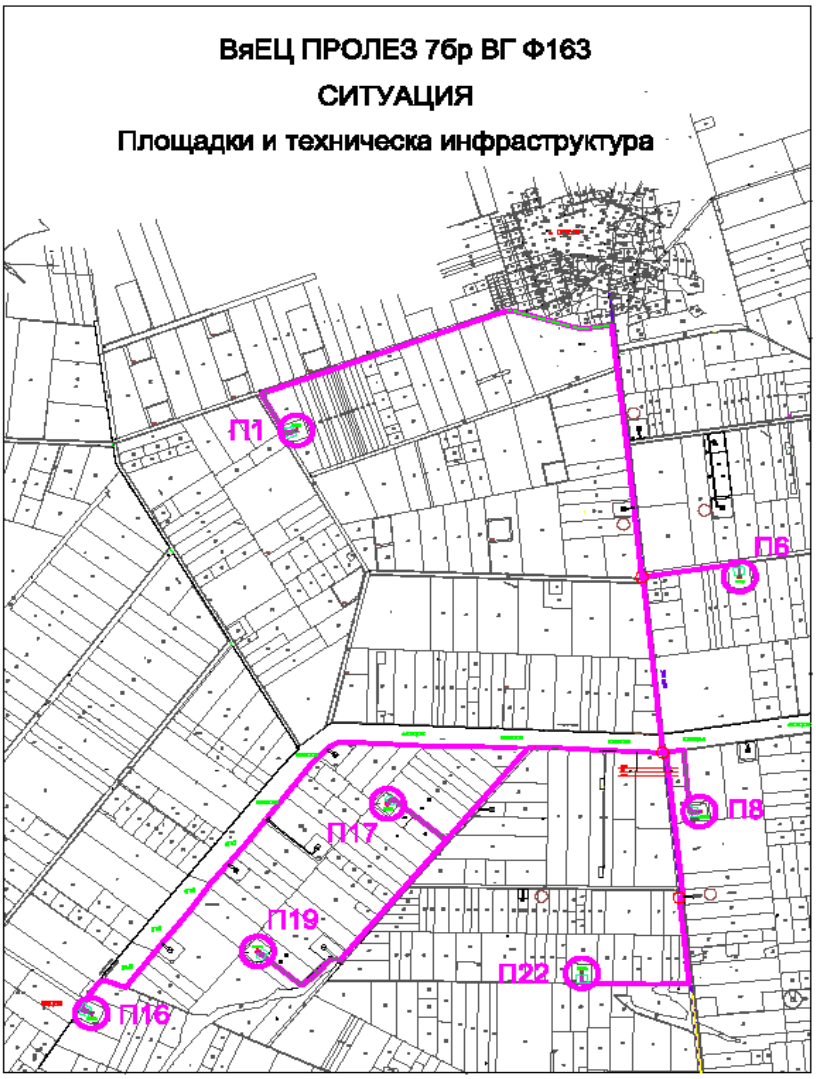

Figure 1.1 –Map WPP Prolez new scope / Platforms and technical infrastructre

Table 3 shows the coordinates and elevation of the land parcels in the new scope.

Table 3 - Geographical coordinates

No.	WT No.	Plot No.	Geographical coordinates center tower		Elevation /m
			N	E	
1	1	58596.14.57	43 34 10.42	28 26 07.18	86
2	6	58596.11.67	43 33 43.45	28 27 43.81	75
3	8	16095.18222	43 33 03.30	28 27 33.51	75
4	16	16095.28.134	43 32 31.29	28 25 18.42	96
5	17	16095.14.103	43 33 05.96	28 26 24.91	76
6	19	16095.14.189	43 32 41.16	28 25 55.42	84
7	22	16095.1672	43 32 36.05	28 27 06.59	68

The construction works of the wind farm include the construction of a foundation for a new generation wind turbine, a road connection to the foundation and a temporary installation /crane/ site with crushed stone /gravel/ excavated.

In the case of larger technical parameters of the turbine, the area of its foundation should be increased in order to maintain its stability. In addition to the main areas for the construction of foundations for the new generation of wind turbines, additional areas of adjacent land are planned. A procedure has been initiated to obtain rights from landowners and to allocate the necessary additional land. /acc. to Figure 1.2/

Figure 1.2 Indicative scheme for the allocation of the additional area required for the foundations

Tables 4, 5 and 6 below provide comparative tables with the areas previously covered by the EIA process and calculations only for the sites in the new, reduced scope.

Table 4 Comparative table - urbanised land with calculations of additional land required in the new reduced scope

FOUNDATIONS AND INTERNAL ROADS

WT	Plot	Scope under procedure			Reduced scope			
№	ID	foundation	ıtern. road	total area m2	foundation	found. extension	intern.road	total area m2
1	58596.14.57	361	2 179	2 540	361	539	2 179	3 079
2	58596.9.52	361	254	615	*	*	*	0
3	58596.10.69	361	2 174	2 535	*	*	*	0
4	58596.10.71	361	473	834	*	*	*	0
5	58596.13.202	361	242	603	*	*	*	0
6	58596.11.157	361	338	699	361	539	338	1 238
7	16095.18.218	361	225	586	*	*	*	0
8	16095.18.222	361	171	532	361	539	171	1 071
път	16095.18.224	0	1 378	1 378	0	0	1 378	1 378
9	16095.18.220	361	273	634	*	*	*	0
12	16095.14.181	361	228	589	*	*	*	0
13	16095.14.183	361	1 988	2 349	*	*	*	0
14	16095.14.185	361	243	604	*	*	*	0
15	16095.14.187	361	243	604	*	*	*	0
16	16095.28.134	361	296	657	361	539	296	1 196
17	16095.14.193	361	2 752	3 113	361	539	2 752	3 652
18 път	16095.14.191	361	2 484	2 845	*	*	2 484	2 484
19	16095.14.189	361	3 577	3 938	361	539	3 577	4 477
20	16095.15.130	361	315	676	*	*	*	0
21	16095.16.74	361	285	646	*	*	*	0
22	16095.16.72	361	243	604	361	539	243	1 143
TOTAL m2		***7220***	***20 360***	**27 580**	***2 527***	***3 773***	***13 418***	**19 718**

The area affected by the construction of foundations and internal service roads, with the number of wind turbines reduced from 20 to 7 units, will be reduced from 27,580 m2 to 19,718 m2, of which 6.30 decares for foundations and 13.42 decares for internal service roads**.**

There is a difference of "+" and "-" 1 sq.m. in three plots, resulting in the total urbanised area changing from 19,717 sq.m. to 19,718 sq.m. The difference in area is due to the conversion of the cadastral map from the 1970 coordinate system to the 2005 BGS.

Table 3 CRANE SITES - to be reclaimed

WT	PLOT	Processed scope	Reduced scope
№	ID	area m2	total area m2
1	58596.14.57	2 058	2 058
2	58596.9.52	2 133	*
3	58596.10.69	2 011	*
4	58596.10.71	1 605	*
5	58596.13.202	1 789	*
6	58596.11.157	1 760	1 760
7	16095.18.218	1 807	*
8	16095.18.199	1 264	1 264
road	16095.18.224	*	*
9	16095.18.220	2 022	*
12	16095.14.181	1 959	*
13	16095.14.183	1 745	*
14	16095.14.185	1 937	*
15	16095.14.187	1 933	*
16	16095.28.134	2 356	2 356
17	16095.14.193	1 249	1 249
18	16095.14.191	1 575	*
19	16095.14.189	1 565	1 565
20	16095.15.130	1 872	*
21	16095.16.74	2 011	*
22	16095.16.72	1 860	1 860
	TOTAL m2	**36 511**	**12 112**

The affected areas of the crane sites, which are temporary and will be reclaimed with the reduced number of wind turbines from 20 to 7, will be reduced from 36,511 m2 to 12,112 m2.

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Access to the investment proposal area is via Class 4 roads. The village of Gorichane and the village of Prolez are accessible by road from the town of Gorichane. Shabla, which is crossed by the first class road I-9 "Romania - Durankulak - Varna - Burgas - Malko Tarnovo - Turkey". The project does not provide for the development of the municipal and republican road network.

A plan layout has been developed for access to the wind turbines during construction and maintenance /the route of the road connections coincides with the cable routes outside the properties/.

It is envisaged that the access roads outside the sites will be permanently surfaced /gravelled / and after the reduction of the scope, the total length will be reduced from 11,200 m to 8,219 m, of which 6,712 m on existing field roads and 1,507 m on the existing municipal asphalt road DOB 3223.

The external road connections will affect 33.56 decares /6.712 km x 5 m wide / already used for dirt roads but not surfaced (in fact, existing dirt roads will be gravelled).

Table 4- Service roads- external

SERVICE ROADS external, m			
Permanent use	**Plot ID**	**Processed scope**	**Reduced scope**
IV class road	16095.18.184	612	612
field road	16095.18.185	772	772
field road	16095.18.92	408	408
field road	16095.15.123	764	*
field road	16095.16.62	529	529
field road	16095.14.63	3	3
field road	16095.14.66	426	*
field road	16095.28.31	207	207
field road	16095.14.64	1 470	1 470
pasture, field	58596.28.50	510	510
field road	58596.17.48	1 280	1 280
field road	58596.28.51	227	227
field road	58596.9.42	395	*
field road	58596.10.42	54	*
field road	58596.10.44	389	*
field road	58596.10.40	737	737
field road	58596.11.121	464	464
IV class road	58596.10.41	59	59
IV class road	58596.11.120	836	836
field road	11003.25.146	105	105
	TOTAL m	**11 247**	**8 219**

The electricity generated by the wind turbines will be connected to the grid via underground cables through a 20/110 kV substation located on land plot 16095.15.26 in the village of Gorichane, Shabla Municipality. Gorichane, Shabla Municipality.

The land plot on which the substation is located has an area of 13 256 square metres, with a permanent use of the area - urbanised and a permanent use "for the production of electricity". The land plot is owned by "NIMEKS-2004" EOOD in accordance with the Title Deed of Sale and Purchase of Real Estate No. 131, Volume 6, File No. 924, Reg. No. 1959 dated 01.06.2009 issued by the Kavarna Registry Office.

The following documents were received in connection with the construction of a substation at land plot 16095.15.26 (Appendix 7):

- Opinion of the RIEW - Varna with reference number 26-00-3283/1/06.07.2009 - on the need for EIA of the investment proposal with the character "does not fall" within the scope of Annexes 1 and 2 of the Environmental Protection Act, "does not fall" within the boundaries of protected areas of the NATURA 2000 network and "is not subject to" compatibility assessment (separate file).
- Building Permit for "20/110 kV Nimeks Booster Station and 110 kV Junction Station" No2/24.01.2011. revalidated on 29.01.2016 by the Chief Architect of Shabla Municipality;
- Protocol Model 2 dated 09.01.2014 for the opening of the construction site and the determination of the

construction line and the level of the construction;

- Protocol Model 10 dated 22.07.2014 for the determination of the state of construction during the suspension of construction.

The possibilities and necessary conditions for the connection of the wind farm to the electricity grid have been agreed in Contract No. EP-64/15.03.2014 with NEK EAD for the Connection of the Electricity Producer to the Electricity Grid and Supplementary Agreement No. 1/12.03.2014 with ESO EAD (Appendix 8).

There is an active and continuous correspondence with ESO EAD regarding the specification of the conditions for connection, detailed technical data and requirements regarding the facilities and the method of connection are given below:

- The connection of the wind farm will be made by the construction of a new 20/100kV BOOSTER SUBSTATION in land plot 16095.15.26, which will remain the property of the client.
- The connection to the 110kV network will therefore be made through the construction of a new 110kV substation adjacent to the on-site substation on the same plot of land, which will become the property of ESO EAD.

The linear infrastructure will be constructed underground along the alignments of existing municipal roads and within zoned land. The approved site plan for grid connection will follow the agreed and approved alignments, but will be implemented in a reduced scope.

The route of the cable lines includes internal cable lines and external cable lines according to the Master Plan: the total scope of 13,188 m is reduced to 9,787 m reduced scope.

The Master Plan for Linear Infrastructure - Route of the 20 kV power line for the connection of land plots in the "Prolez" Wind Park has been coordinated by the RIEW - Varna by letter No. 26005069/2/18.09.2014 (in a separate procedure Appendix 9).

The project for the Master Plan for Linear Infrastructure - Route of the 20 kV power line has been coordinated by the Municipality of Shabla and the Municipality of Kavarna and approved by the valid order of the Regional Governor of Dobrich Region.

The specific zoning designation of each plot is "for energy production".

For each of the plots included in the reduced scope, a master plan for development has been prepared and adopted, approved by a decision of the Municipal Council of the Town of Shabla. Shabla, according to the Minutes of the Shabla Town Council No. 8/04.04.2012. . By Minutes No. 56 of 22/05/2019 and Decision No. 558 of the Municipal Council of Shabla, Decisions No. 81 to 101 on the approval of the master plan were cancelled. The company "NIMEKS-2004" EOOD appealed to the Dobrich Administrative Court against the decision of the Shabla Municipal Council No. 558 from the Protocol of the regular meeting of the General Assembly No. 56/22.05.2019.

By decision No. 293/27.07.2022 of the Administrative Court of Dobrich, on the appeal of Nimeks-2004 EOOD, the decision of the Municipal Council of Shabla No. 558 was annulled and the Municipal Council of Shabla was ordered to pay to Nimeks-2004 EOOD the costs of the proceedings and the lawyer's fees. The decision was not appealed in time and has entered into force (Appendix 10).

In connection with the new reduced scope of the investment proposal and the increased technical parameters of the facilities, the affected public of the city of Varna was duly informed in accordance with the instructions of the competent authority RIEW-Varna. Shabla, Prolez and Gorichane. A notice and information on the changed scope and technical parameters were posted in prominent places in the town halls and the municipality. An advertisement was placed in the local newspaper. Responses were received from the two villages of Gorichane and Prolez.

Notifications with detailed information were also sent to the following interested parties Shabla, Institute for Biodiversity and Ecosystem Research at the Bulgarian Academy of Sciences, National Museum of Natural History at the Bulgarian Academy of Sciences, Bulgarian Wind Energy Association, Association for Production,

Storage and Trade in Electricity, Bulgarian Society for the Protection of Birds, Green Balkans, For the Earth Environmental Association, Bulgarian Biodiversity Foundation, WWF Bulgaria, Kaliakra Tourism Association.

The siting of the wind turbines, including the new reduced scope of the investment proposal and the increased technical parameters of the installations, has been coordinated by the General Directorate of Civil Aviation by letter no. 18-00-820/27.10.2022 and by the Air Force Command by letter no. 400-8754/14.10.2021, with instructions for their marking in accordance with the regulatory requirements (Regulation no. 14 of the Ministry of Transport).

No objections were received within the statutory time limit. No comments were received on the impact of the WPP on the environment and the population (all communications and notifications in Appendix 11).

Recap:

- **Permanently affected areas total 53.28 decares, averaging 7.61 decares per turbine, of which:**

- **Within own land plots- 19.72 decares / foundations 6.30 decares and internal roads 13.42 decares/**
- **Outside own land plots - 33.56 decares / cable routes and fencing of existing country roads);**

- **Temporarily affected areas total 13.62 decares, of which:**

- **Within own land plots– 12,11 decares / assembly sites 12,11 decares/**
- **Outside own land plots – 1,51 decares /cable routes in easement of existing municipal asphalt road DOB 32/**

The village of Prolez is located in northeastern Bulgaria northwest of the town of. The village of Prolez is located in the northwest of the village of Shabla (6,5 km). The village is 9 km from the Black Sea, 4.5 km from the village of Gorichane, 4.5 km from the village of Vidno, 6.5 km from the village of Septemvriytsi, 9.5 km from the village of Belgun, 3 km from the village of Neykovo, 7.6 km from the village of Vaklino, 6 km from the village of Ezerets, 6 km from road I-9 "Durankulak-Varna-Burgas-Malko Tarnovo.

The village of Gorichane is located in northeastern Bulgaria west-southwest of the town of Shabla (5 km). The village is 10 km away from the Black Sea, 4 km from the village of Gorun, 4.5 km from the village of Prolez, 6.4 km from the village of Vidno, 5 km from the village of Rakovski, 4.3 km from the village of Poruchik Chunchevo, 5.2 km from the village of Hadzhi Dimitar, 4 km from road I-9 "Durankulak- Varna-Burgas-Malko Tarnovo.

Geomorphologically, the area belongs to the coastal part of the Danube plain - Danube morphostructural zone - Dobrudzha plateau. The area of the investment proposal has a flat and uniform relief. The area in which the Park is located is flat with the average altitude of 95 ÷ 110 m above sea level.

The area is not prone to landslides. There are no denudation-erosion and abrasion processes in the vicinity, as the area is too far from the coast. The topographical conditions are considered favourable for the generation of wind energy. The site is not subject to a building ban under the Spatial Planning Act (SPA).

The investment proposal has no transboundary impacts.

The area under consideration does not fall within zones "A" and "B" of the Black Sea Coastal Development Act.

The area on which the investment proposal will be implemented is agricultural land, category III with land use type "fields".

The investment proposal is not related to the use of water bodies. There is no provision for water supply to individual properties. As a result of the inspection, it has been established that the land plots do not fall within the sanitary protection zone I of water sources and that no prohibited or restricted activities are planned in zones II and III pursuant to Decree No. 3 of 16.10.2000. On the conditions and procedure for the study, design, approval and operation of sanitary protection zones around water sources and installations for drinking water supply and around mineral water sources used for medicinal, prophylactic, drinking and hygienic purposes (promulgated, SG 88, 27.10.2000). This was confirmed by letter no. 26-00-3282 dated 29.10.2009 from the Black Sea Basin Directorate - Varna.

According to the opinion of the Dobrich Water and Sewerage Company, there are no underground water or sewerage networks running through the land parcels in the new area.

According to the list published in accordance with the requirements of Article 12, Paragraph 1 of the Decree No. 6/2000 Coll. on emission standards for the permissible content of harmful and dangerous substances in waste water discharged into water bodies /DV 97/2000, 24/2004/, the area of the investment project is declared a "sensitive area" - Decree No. RD-970/28.07.2003 of the Ministry of the Environment and Water.

The investment proposal is not related to the discharge of wastewater into water bodies.

The requirements for distances between wind turbines are regulated in Article 141a of Regulation No. 14 of 15.06.2005 on technical rules and regulations for the design, construction and use of installations and equipment for the generation, conversion, transmission and distribution of electricity as follows:

- in the direction of the prevailing wind L1 = from 5 to 7 times D (D - the length of the rotor diameter of the turbines) - in our case it is 815 ÷ 1 141 m;
- in the direction perpendicular to the prevailing wind direction L2 = 3 to 5 times D - in our case it is 489 ÷ 815 m.

The recommended distance requirements for WPPs from different locations are as follows:

- from enclosed settlements: > 500 m - the requirement is met - see Tab. 1.4-2;
- from woodland: >35 m - the requirement is met - see Tab. 1.4-2;
- from protected forests: >200 m - requirement is met;
- from flowing water sources: >100 m - the requirement is met;
- from national or local roads: >50 m;
- from national and international roads: at least >100 m - the requirement is met, the first class international road I-9 "Romania - Durankulak - Varna - Burgas - Malko Tarnovo - Turkey" is more than 5 km away;;
- from high voltage power lines (> 30 kV) > 3 times the rotor diameter (in this case up to 489 m), with wire buffers 1 times the rotor diameter (in this case up to 163 m) - the requirement is met;
- from gas pipelines : >30 m on both sides of the pipeline - requirement met;
- from transmitter paths: > 5 and 50 m on each side, depending on the mobile operator's transmission path - requirement fulfilled.

The arrangement of the wind farm elements shall comply with the above requirements.

The area subject to the proposed investment does not fall within the scope of protected areas of the NATURA 2000 network, designated in accordance with the requirements of the Habitats Directive, Directive 79/409/EEC on the conservation of wild birds and Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.

The area of the wind farm does not fall within the boundaries of any protected areas - the closest being the Shablensko Lake Protected Area - located about 10 km to the east.

There are no watercourses, lakes or swamps in the vicinity of the wind farm.

The adjacent areas are occupied by arable land with intensive grain production. There are no steppe habitats or grasslands.

There are no gullies, valleys, ravines, hollows, etc., which are treated as "water bodies" under the Water Act, and therefore no water use permit is required.

The distances of the wind turbines from the landscape elements and from the settlement regulations are shown in Table 2. For the location of the wind turbines, there are opinions of the RHI-Dobrich, which, on the basis of Article 6(1) of the already repealed Regulation No. 7 of 25 May 1992 on hygienic requirements for health protection of the residential environment, as amended and supplemented, states that the hygienic protection zone is determined by the

Ministry of Health - as is known, Regulation No. 7/1992 does not regulate a hygienic protection zone for wind turbines (the opinions were submitted to the competent authority in the course of the EIA procedure). This regulation has now been repealed, and the procedure for hygienic setbacks will be carried out under the procedures of the Spatial Planning Act and the Environmental Protection Act.

At present, distances are regulated by Art. 14 of 15 June 2005 on technical rules and regulations for the design, construction and use of installations and equipment for the generation, transformation, transmission and distribution of electricity (SG No. 53 of 28 June 2005, as amended). Art. 73 of 5 September 2006 - **there are no wind turbines within 500 m of the populated area in the wind farm under consideration.**

2. Description of the investment proposal

2.1. Implementation of the investment proposal (construction period, operation period, closure)

Construction Phase

During the construction period, the following types of works will be carried out on site
- Mobilisation;
- Preparatory works;
- Earthworks (excavation and filling);
- Concrete, formwork and reinforcement works;
- Installation works;
- transport works (of oversized loads);
- Electrical works;
- Painting works;
- Road works;
- Finishing works;
- Demobilisation.

No specific foundation works (piling or artificial ground reinforcement) are foreseen at this stage. No blasting is foreseen.

The duration of the construction period is estimated by experts to be ~2 months per wind turbine. As several generators will be built in parallel, the total construction time will be about 1 year. The average number of workers to complete 1 wind turbine is 12 people. If 3 teams are formed, the number will be 36 people. A chemical toilet will be provided for the workers on site.

Figure 2.1. Rotor installation

Excavation is carried out with a backhoe. Removal of soil is carried out with dump trucks. Planning and road works are carried out by bulldozer or grader. Concrete is delivered by concrete lorries from nearby concrete plants. The installation of the tower and the wind turbine blades is carried out by a special crawler crane with a high lifting capacity. The gravel surface is compacted by a roller and the backfill is compacted by vibratory plates. The site is

powered by a diesel generator. The humus will be stored in a temporary humus landfill in accordance with regulatory requirements (Regulation No 26).

Figure 2.1-2. Trench for underground cables

The wind turbine components will be transported to the site by road. An example of a transport plan is shown in Appendix 12. The individual elements are of considerable weight and will be transported as oversized loads.

Figure 2.1-3. Transport of wind turbine components

The installation of the wind turbines is carried out using a crawler crane with a large lifting capacity adapted to the weight of the installed components (Figures 2.1-1 and 2.1-4):

Figure 2.1-4. Installation of wind turbine components

Service life

According to the prospectus, the service life of the turbine is 20 years.
During the operating period, the following activities will be carried out:
- Periodic inspection of the turbine through on-site inspections and measurements;
- Maintenance and replacement of certain elements and systems of the plant (oil changes, replacement of electronic and electrical equipment);
- Repair of broken or corroded parts of the plant (fins, units, etc.).

The environmental impact during this period is generally minimal due to the small scale and duration of the listed works.

Figure 2.1-5. Formwork, concrete and reinforcement work on the wind turbine foundation

Figure 2.1-6. Graveling an existing country road

Closing

The decommissioning (dismantling) phase involves the same types of impacts as the construction phase, but the impacts are smaller for several reasons:
- The site is already less sensitive than during the installation of the wind turbines;
- The duration of the decommissioning phase is shorter than the construction phase.

Decommissioning includes
- Preparatory work (draining of oils, dismantling of electrical and electronic equipment, disconnection from the grid, preparation of the dismantling site);
- Dismantling and removal of the wind turbines;
- Dismantling (crushing) and recycling of their foundations;
- Dismantling and recycling of pavements;
- Dismantling of underground cables and restoration of trenches;

- Technical site remediation;
- Biological site remediation (restoration of agricultural land);
- removal of construction and other waste to regulated landfills.

The duration of the closure phase is estimated by experts to be ~6 months.

2.2 Total area required (including construction period)

The area on which the investment proposal will be implemented has been used for cereal cultivation in recent years. The implementation of the facilities will not interfere with the agricultural use - for each facility, only the foundation area and the internal road connection for transport access will be changed.

During construction, some of the remaining land will be used for temporary activities, mainly related to the installation of the turbines, which will then be restored. During operation, no crane site will be required for replacement of units and components. However, if necessary, the 'excavated' crane pad could be used by temporarily removing the topsoil above it. Once the work is complete, it will be returned.

2.3 Technology of wind power generation, technological scheme and parameters of the wind turbine

One of the most important features of the investment proposal for the construction of wind turbines is the generation of electricity from renewable sources. These sources are characterised by the fact that their use does not lead to the depletion of the earth's natural resources, such as coal, oil and other mineral fuels, and does not lead to the accumulation of hazardous waste, as in the case of nuclear (NPP) and thermal (TPP) power plants. In this sense, the implementation of the investment proposal is in line with the energy strategy of the Republic of Bulgaria and is directly related to the reduction of harmful emissions into the atmosphere.

The development of renewable energies in general, and wind energy in particular, is part of the effort to protect our planet's environment. If 30 years ago they were developed with the aim of saving oil, today their main aim is to reduce gas emissions and the greenhouse effect. Following the implementation of the Kyoto Protocol, interest in renewable energy sources has led the EU to promote them widely (Directive 2001/77/CE of 27 September 2001 on the promotion of electricity produced from renewable energy sources).

Wind power has grown rapidly in Europe over the past decade. In 2008, it accounted for 4.8% of total European electricity consumption. It is therefore clear that the number of wind power installations in the EU is expected to increase radically in the short to medium term. It is important to stress that such a rapid expansion is, of course, appropriate in all respects and has been carried out in accordance with EU environmental legislation, including the Habitats and Birds Directives.

Evidence to date shows that while wind energy does not pose a serious threat to wildlife, poorly sited or designed wind farms can pose a potential threat to vulnerable species and habitats, including those protected under the Habitats and Birds Directives.

Wind technologies harness the energy of air masses above the earth's surface, which are set in motion by the sun's heat and the earth's motion. The air drives the blades of the wind turbine through the force created by the difference between the pressure on the flat surface of the blades and the low pressure on the opposite side. Their rotation results in the direct production of mechanical energy, which can be converted into electrical energy using an electrical generator.

One of the reasons for the rapid growth of wind power is that the technology has evolved significantly over the last 20 years. The size of onshore turbines has increased from less than 50 KW in the 1980s to more than 8 MW today. Rotor diameter has also increased from an average of 15 metres to 125 metres or more.

Today, three-bladed upwind turbines with variable speed and pitch control of up to 8000 KW dominate the market, accounting for about 90% of the EU market. Their installation costs have also fallen significantly in recent years, making wind farm development not only more financially feasible but also more attractive to investors (EU Handbook on wind energy development in compliance with EU environmental legislation, EC, October 2010).

The wind energy system consists of wind turbines, transformers and underground cables. The turbine (generator) itself consists of a foundation, tower, nacelle, blades, rotor sleeve and signal lights.

In general terms, a wind turbine is a device that converts wind (kinetic) energy into electricity. Unlike wind water pumps, which have many blades to produce more torque, electricity generators have 2 or usually 3 blades, with the aim of achieving a high rotational speed. In addition to the horizontal axis, generators can also have a vertical axis.

3. Comparison of the proposed technologies and facilities with the conclusions of the Best Available Techniques comparison documents. Assessment of the compliance of the site with regulatory requirements.

3.1.Wind turbine specific impacts and management

This section summarises the environmental, health and safety (EHS) issues associated with wind energy facilities and recommendations for their management. The material is based on the International Finance Corporation (World Bank Group) requirements set out in the Environmental, Health, and Safety Guidelines for Wind Energy (2007) - Environmental, Health, and Safety Guidelines for Wind Energy. These Guidelines are technical reference documents that provide general and wind industry-specific examples of good international industry practice. Where one or more members of the World Bank Group are involved in a project, these Guidelines will be applied as required by their respective policies and standards. The Guidelines are to be used in conjunction with the General Environmental, Health and Safety Guidelines, which provide users with recommendations on all general environmental, health and safety issues applicable to all industry sectors. For a complete list of industry sector guidelines, please visit: www.ifc.org/ifcex/enviro.nsf/Content.

3.1.1. Environment

Construction activities for wind energy projects typically include land clearing to prepare the site and access roads; excavation, blasting and backfilling; transportation of materials and fuels; foundation construction involving excavation and concreting; craning to install equipment; and commissioning of new equipment. Decommissioning activities may include removal of project infrastructure and site restoration.

Environmental issues associated with these activities can include noise and vibration, soil erosion and threats to biodiversity, including habitat alteration and impacts on wildlife. Due to the remote location of wind turbines, transport of equipment and materials during construction is also an issue.

The environmental issues specific to wind farms are:

- Visual impact
- Noise
- Species mortality or injury and disturbance
- Lighting issues
- Habitat alteration

3.1.2. Visual impact

Depending on its location and the perception of local residents, a wind farm can affect visual perception and the landscape. Visual impacts associated with wind energy projects typically relate to the turbines themselves (e.g. colour, height and number of turbines) and to the impacts associated with their interaction with the character of the surrounding landscape.

Measures to prevent and control visual impact include:

- Consultation with the public on the location of the wind farm;
- Consideration of turbine location in relation to landscape characteristics;
- Considering the visual impact of turbines from all viewpoints when considering location;
- Reducing the presence of ancillary structures on site by avoiding fencing, reducing access roads, undergrounding power cables and removing inoperative turbines;

- Avoiding steep slopes, provide erosion control measures and biological restoration of affected areas using only native species;
- Maintaining uniform turbine size and design (e.g. direction of rotation, turbine and tower type, height);
- Painting turbines a uniform colour to match the sky (light grey or pale blue), complying with marine and air navigation marking regulations;
- Avoiding signs, advertisements, company logos or graphics on turbines.

3.1.3. Noise

Wind turbines generate noise when in operation. The main sources of noise are mechanical and aerodynamic. Mechanical noise can be generated by machinery in the nacelle. Aerodynamic noise is generated by the movement of air around the turbine blades and tower. The type of aerodynamic noise can include low frequency, tonal and continuous broadband noise. In addition, the amount of noise can increase as the speed of the turbine blades increases, so turbines that allow lower speeds in stronger winds will limit the amount of noise generated.
Noise prevention and control measures are mainly related to engineering design standards. For example, broadband noise is generated by air turbulence behind the blades and increases with increasing blade speed. This noise can be controlled by using variable speed turbines or pitched blades to reduce the rotational speed. These technologies are incorporated into the design of the wind turbine under consideration.

Other recommended noise control measures include:

- Appropriate siting of wind farms to avoid close proximity to sensitive noise receptors (e.g. population centres, hospitals and schools);
- Adherence to national and international acoustic standards for wind turbines (e.g. International Energy Agency, International Electrotechnical Commission and American National Standards Institute).

Noise impacts must not exceed the levels set out in the General Environmental, Health and Safety Guidelines and must not result in an increase of 3 dB at the nearest receptor.

However, noise from wind farms tends to increase with wind speed, as does general noise due to air friction over existing landscape features. Increased wind speeds can also mask noise from the wind farm itself, and wind speed and direction can affect the direction and extent of sound propagation. The application of recommended noise levels and the assessment of the overall noise level should take these factors into account.

Additional consideration may need to be given to the annoyance factor associated with impulsive or tonal noise characteristics (sound with a specific frequency similar to musical notes) emitted by some wind farm configurations.

4. Alternatives for location, capacity and technology and the reasons for the choice made, taking into account environmental impacts, including a 'no action' alternative.

Alternatives were considered in terms of sources of electricity generation, location and type of wind turbines, situational solutions for road and cable networks, construction of installation sites, etc.

4.1 Alternatives for electricity generation sources

The options for generating electricity from renewable energy sources are:

- Hydroelectric power stations;
- Wind power plants;
- Geothermal power plants;
- Photovoltaic (solar) systems;
- Biomass energy conversion plants.

Wind power plants are classified as follows:

Depending on the location:
a) onshore;
b) offshore;

Depending on the use:
a) own source of electricity;
b) connected to an autonomous (independent) grid;
c) connected to the distribution and/or transmission network.

The implementation of this investment proposal is in line with the measures set out in the Regional Development Plan for the North East Planning Region (NEPR). According to the Strategic Objective 1 - Development of a dynamic economy based on competitiveness and innovation, the measure formulated is Priority 1 - Development of infrastructure contributing to the competitiveness of the region: Development of infrastructure for water extraction and use of renewable energy sources, for which the NEPR has the advantage of having specific potential.

4.2 Alternatives for the location of the wind farm

The construction of wind turbines is only appropriate in areas with sufficient wind energy potential.

- First alternative - location of the WPP north of the village of Klimentovo, Aksakovo Municipality, Varna District.

Initially, the area around the village of Klimentovo was selected as the location for the investment proposal, as preliminary data from nearby meteorological stations indicated good wind potential. The alternative was positively assessed in relation to the proximity of the area to the large city of Varna and the developed power grid in the area.

The wind farm was to be developed on land owned and leased by the client. The investment proposal started with the acquisition of land plots in the village of Klimentovo- Title Deed for purchase and sale No. 140/22.05.2006 The land parcel number is 027272. On the land, the client installed measuring equipment for accurate analysis of the wind potential.

Figure 4.2.2. Alternative location of the WPP in the area of Klimentovo

Consultations were held with the Regional Inspectorate for Environment and Water in Varna and with members of the Bulgarian Society for the Protection of Birds in Varna, who identified potential conflicts with the location of the draft Natura 2000 site - the "Batova" site, designated under the requirements of Directive 79/409/EEC for the conservation of wild birds.

A preliminary assessment of the environmental impact of the WPP has been carried out - **medium to significant impact** on migratory waterbirds, impact on raptor feeding sites, forest edge species and agricultural steppe species.

- Second alternative – location of the WPP in Shabla Municipaloty, Dobrich District.

Preliminary studies for this area have led to the selection of an area relatively distant from:
- the potential protected areas of the Shabla and Durankulak lake complexes, Kaliakra;
- populated areas and holiday resorts;
- landforms - valleys, gorges to the west of Shabla;
- traditional feeding areas for wintering birds.

In 2006-2007, consultations were held with experts from the Bulgarian Society for the Protection of Birds on the possible location of a wind farm. The experts' data showed a low sensitivity of the area in the lands of Prolez and Gorichane due to: low bird migration according to monitoring data, the fact that the areas are not part of the future Natura 2000 network and due to the lack of wintering geese in the area.

At the same time, the Municipality of Shabla is carrying out the zoning of the territory of the Municipality by defining a "Zone for the construction of wind energy plants" by Resolution №IX.II.1.1/20.10.2005 of the Municipal Council of the town of Shabla. Letter No. K-2108, K-2107 dated 25 October 2009 from the Mayor of the Municipality of Shabla confirms that the territory of the investment proposal falls within this defined zone.

Location Alternatives Relative to Sensitive Areas / Considering Wind Energy Density/

Figure 4.2.3 shows the location of the two IP alternatives in relation to sensitive areas in north-eastern Bulgaria. The Klimentovo alternative poses significantly higher risks in terms of proximity to sensitive areas - migration, resting and moulting areas for birds, as well as foraging and nesting habitat for species of conservation concern.

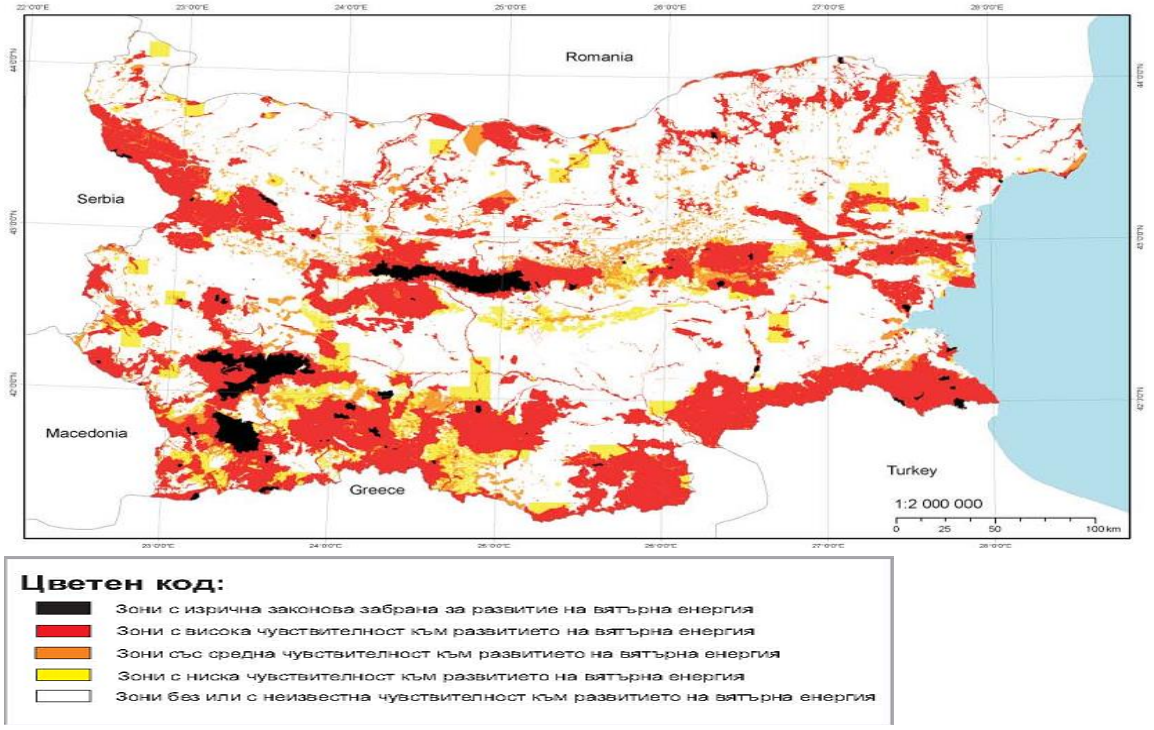


Figure 4.2.3 Sensitive areas /source Environmental Assessment Report of the National Renewable Energy Action Plan/

Alternatives for WPP siting in relation to migration corridors

The Shabla alternative is characterised by its distance from the main migration corridors of raptors and waterbirds with high migration intensity. The figure below shows the location of the WPP in relation to migration intensity.

/Source: "Assessment map and GIS model with bird risk areas for wind turbine construction"/.

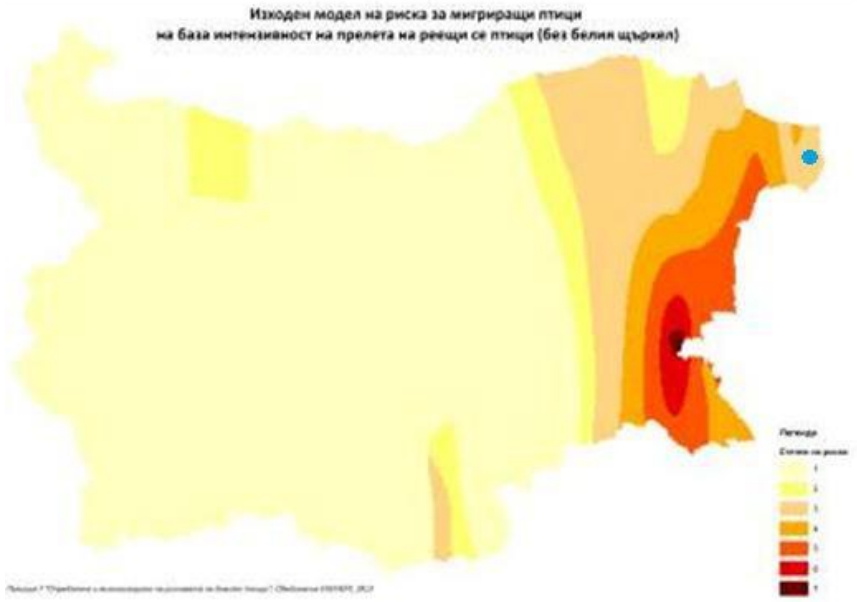


Fig. 4.2.4 Bird migration intensity

Figure 4.2.4. illustrates the location of the WPP in the third zone /of 7 possible/ - low intensity of bird migration in relation to the baseline model for the sensitivity assessment /source "Assessment map and GIS model with the risk zones for birds in the construction of wind turbines"/.

The Klimentovo alternative is located in zone 5 - with a relatively high intensity of bird migration.

Bird migration in the Batova /Klimentovo/ area is 7-10 times more intense than in the Shabla area. The Klimentovo alternative would harm biodiversity.

4.3. Alternative locations for the wind turbines in the wind farm area

In addition to the location of the wind farm, the Client has carried out an assessment of potential sites for the installation of the wind turbines based on a survey of its territory in terms of:

- the distance to health sensitive areas
- the existence of validated health protection areas
- The presence of protected areas and NATURA 2000 sites;
- the presence of areas where prospecting and exploration permits or mineral concessions have been granted;
- morphological characteristics - flatness of the terrain and lack of screening barriers;
- the distances of the wind turbines from the landscape elements referred to in Art. 30, par. 3 of the Biodiversity Act.

The sites have been selected and purchased so as not to affect National Ecological Network sites. The purchase of a particular site will be subject to availability on the property market. The land has been rezoned and the locations of individual wind turbines have been identified to minimise the area of change of use.

In selecting the site, the client has also taken into account the requirement for the location of a minimum number of generators, as well as the distances to neighbouring wind turbines, in accordance with Article 141a of Regulation No. 14/2005 on technical rules and regulations for the design, construction and use of sites and facilities for the generation, conversion, transmission and distribution of electricity.

Alternatives for the configuration of WPP in relation to migration directions

The "Guide to Wind Energy Development and Natura 2000" /ISBN 978-92-79-19304-0 doi:10.2779/31640/ recommends that wind farms should be sited in the direction of bird migration rather than perpendicular to it to minimise the impact of barriers. The same recommendations are made in the Guidelines for the Assessment of the Likely Level of Impact of Investment Proposals for the Construction of Wind Turbines on Specific Habitats and/or Species of Conservation Concern in Protected Areas issued by the MoEW.

The main direction of bird migration in the Shabla region is north-south-northeast-southwest. The wind farm is oriented north-northeast and south-southwest along the main migratory directions.

The alternative of siting the wind turbines perpendicular to the flight direction would create a significant barrier for this IP.

Alternatives for the number of turbines

During the feasibility studies, the client considered several alternatives for the number of turbines in the farm:

- First Alternative - maximum number of turbines with maximum capacity

This alternative considers the possibility of building a wind farm with 26 wind turbines. In addition to the 20 wind turbines originally applied for and 2 wind turbines that will be subject to a separate assessment, the client has included the possibility of constructing further turbines on the following sites with preliminary agreements:

Table 4.3-1 Alternative sites for additional wind turbines

	Property	Land	Contract	REASON for rejection at the preliminary stage
1	58596.14.14	Prolez village	Preliminary agreement	Proximity to other park or adjacent facilities - solid barrier
2	58596.14.28	Prolez village	Preliminary agreement	Proximity to other park or adjacent facilities - solid barrier
3	58596.14.12	Prolez village	Preliminary agreement	Proximity to other park or adjacent facilities - solid barrier
4	16095.17.57	Gorichane village	Preliminary agreement	Situated in an area of established goose grazing north-east of Gorichane

NB: For the plots, the client has signed a preliminary agreement to establish the right to build and use, invested funds in 2008, and obtained the necessary documents.

- Second Alternative - Reduced Number of Wind Turbines 20
- Third alternative - if the recommendation "***not to construct turbines No. 3 and No. 4 in the vicinity of preferred foraging areas of the species***" is implemented, the WPP is reduced to 18 wind turbines.
- In this report the number of wind turbines is reduced to 7.

In practice, the wind farm is reduced to 70% of the investor's original intentions.

The number of wind turbines is changed (reduced) in the revision process, so the old name is no longer relevant, but it is retained for procedural reasons. The reduction in the number of wind turbines is based on the advice of the experts preparing the report and is in favour of reducing the 'barrier effect'.

4.8. "Zero" alternative

In the expert's opinion, the zero alternative is not indisputably more environmentally friendly, for the following reasons. The Zero Alternative would maintain the status quo of 19,717 decares of arable land, which represents less than 0.1% of the agricultural area of the municipality of Shabla.

The development of intensive agriculture in the area, associated with fertilisation and the use of pesticides, is in no way more environmentally friendly than the activity envisaged in the Investment Plan, particularly in terms of its impact on soils, surface water and groundwater.

It is also important to take into account the damage to the environment and human health (although not in this area) that would be caused by producing the same amount of electricity conventionally.

In terms of reducing carbon dioxide emissions into the atmosphere, the installed capacity will produce over 120 million kWh of electricity and prevent the release of 120,000 tonnes of CO2. The production of 1 kWh of electricity from conventional energy sources is associated with the release of 750 - 1250 g of CO2.

The zero alternative is indirectly linked to the need to build new nuclear power stations, which, as the events at Fokushima have shown, are still not reliable or safe enough.
The zero alternative would maintain the status quo and environmental parameters. It also contradicts current European views and policies on sustainable environmental development in terms of energy efficiency and electricity generation from renewable energy sources. According to the Integrated Energy and Climate Plan of the Republic of Bulgaria, 2021-2030, Bulgaria has adopted a target of 30.33% for the share of renewable energy in electricity consumption by 2030. The target represents an increase of 43% compared to the 2020 level of 21.43%.

The social impact of providing additional income and jobs in the village cannot be overlooked. The fact that we are the poorest and lowest income EU member state cannot be ignored. It is well known that the ecology of a poor country is weak. In this respect, it is unjustifiable not to use the existing potential and qualities of the environment to implement investment proposals, as long as this is done sensibly and with a long-term perspective.

5. Description and analysis of the components and factors of the environment and the material and cultural heritage that will be significantly affected by the investment proposal, as well as the interaction between them

According to the Environmental Protection Act, the components of the environment are: ambient air, atmosphere, water, soil, subsoil, landscape, natural sites, mineral diversity, biodiversity and its elements, and the factors that pollute or damage the environment may be: natural and anthropogenic substances and processes; various types of waste and their locations; hazardous energy sources - noise, vibration, radiation, as well as certain genetically modified organisms. Of these, the following are selected in the revised EIA Terms of Reference as significant (largely affected by the investment proposal) in this case:

- Atmosphere and ambient air (construction phase)
- Soil
- Geological environment
- Waste
- Landscape
- Biodiversity and its elements
- Energy risk factors (noise, vibration and electromagnetic radiation)
- Health risk to the public and workers on site

5.1. Atmosphere and ambient air

5.1.1.Climatic and meteorological parameters

The municipality of Shabla belongs to the area with a temperate continental climate, moderated by the influence of the Black Sea basin. Strong winds are a very specific element of the climate. Cold air masses associated with continental climatic events often invade.

Climatic and meteorological factors have a great influence on the level of air pollution in the air basin. They directly contribute to the better or worse dispersion of pollutants emitted by sources.
The area of the investment proposal is characterised as windy above normal for Bulgaria. Winds from the northern quarter are about 70%. Winds up to 10 m/s cover about 60% of the area. The area is characterised by moderate and strong winds - the average annual wind speed is about 4.5 m/s. The average annual frequency of days with stronger winds (over 5 m/s), which cause high turbulence and effectively disperse pollutants, is 33.3%. The region is characterised by strong northerly winds in winter, which blow away the snow cover in places, causing frost damage to autumn crops, and drifting snow on roads, making transport difficult. This has necessitated the creation of field protection belts. The winter months are also characterised by frost and icing, which can lead to power cuts.

5.1.2. Assessment of air quality.

The area has a low potential for air pollution. There are no sources and conditions for the creation of a permanent zone of polluted air in and around the area of the proposed investment.
The main sources of air pollution are:

- Road traffic;
- Domestic heating in residential areas;
- Agricultural activities;
- open areas with bulk materials (landfills, quarries, dumps, etc.).
- Dust storms.

There are no organised sources in the area of the wind farm.

Of the non-organised sources, the most important are area sources: agricultural land, landfills, quarries, open urban and rural areas (roads, grassless areas, construction sites, etc.). Dust is the main pollutant. In the case of municipal solid waste landfills, the pollutant is also biogas, which is released during the anaerobic decomposition of the waste. When stubble is burned, the air pollutants are the combustion gases - a product of burning plant residues.

Vehicle pollution is not significant on the Shabla-Gorichane road due to the low traffic intensity, but it is more important on the route of the first class road I-9 "Romania-Durankulak-Varna-Burgas-Malko Tarnovo-Turkey". For this purpose, an impact assessment has been carried out.

Another source of air pollution is the domestic sector in the populated areas, which emits dust, sulphur dioxide and soot into the atmosphere during the heating season. The small number of inhabitants in the villages of Gorichane and s. Gorichane and s. Prolez make this source of pollutants negligible.

Emissions from construction sites have increased in recent years, especially in the coastal zone, due to intensive development of existing and new sites. However, there is no such intensive construction in the study area. The expected intensification is a consequence of the construction of wind turbines. This impact can be reduced if certain measures are taken: dust-proofing and cleaning of construction sites, 'wrapping' of construction sites with dust-proof fabric, disposal of construction waste in covered chutes or pipelines, covered transport and storage of aggregates, etc.

Emissions from rural landfills will cease completely once they are sealed and reclaimed.

There are no active aggregate quarries in the vicinity of the study area that are sources of dust.

At present, no excess air pollution has been identified in the area of the proposed investment.

5.2. Soil

The municipality of Shabla is located in north-eastern Bulgaria. It is the seventh largest of the 8 municipalities in the Dobrich region. It borders the Black Sea to the east, Romania to the north, and Kavarna and General Toshevo to the southwest and west. The average altitude is 48 m. The total area of the 16 land districts of Shabla Municipality is 329639 decares, which is 7.0% of the area of Dobrich Region and 5.6% of the area of the Black Sea coast.

Agricultural areas occupy a total of 284,433 decares (80% of the municipality, which is much higher than the national average of 58.7%). The cultivated area is 261058 ha, which is 91.8% of the agricultural areas and 79.2% of the whole municipality, this indicator being one of the highest in the country. The largest part is occupied by arable land, while permanent crops and meadows have a negligible share. The cultivated area of the forest fund is less than 100 decares, and the field protection belts occupy only 2.05% of the municipality's territory.

The site or route required for the construction or expansion of the site on agricultural land shall be determined by a draft detailed development plan. The draft detailed development plan shall be prepared in accordance with the requirements for the award, the standards for the land required for development and the scope and content of the development plan as set out in the Planning Act. Along with the main site or alignment for each site, the necessary auxiliary and additional sites, utilities, spoil disposal sites, reclamation sites, temporary use sites and other sites associated with the construction of the site shall be identified. The alignments of linear sites shall generally be established parallel to the minimum allowable distance from existing linear and other sites and shall, wherever possible, be consistent with property boundaries in order to minimise the amount of site area required and to cause minimum disruption to the use of agricultural land.

At least two locations or routes shall be identified for each site where the land affected is in categories 1 to 6. In this regard, the Client has considered alternative sites in the Gorichane and Prolez village areas. Their impacts have been assessed in this report.

5.3. Geological setting

The area under consideration is located in the easternmost part of the Danube Highlands, which in turn is the northernmost major morphographic area of the great diversity of topography in Bulgaria. It is developed on the Mizian thrust platform, with weaker internal differences in relief dissection.

Geomorphologically, the area belongs to the coastal part of the Danube plain - Danube morphostructural zone, Dobrudja-Frangian region, Durankulak-Shablenska subregion.

The geological structure of the area is relatively simple. It consists mainly of loess and loess-like clays with a thickness of a few tens of centimetres in the eastern part and up to 15-20 metres in the western part of the municipality. Along the rocky coast, the loess cover is almost absent and the Miocene deposits are directly exposed.

5.4 Waste

The area under consideration for the implementation of the investment proposal at this stage is not seriously burdened with legacy pollution and waste generation.

Waste will be generated on the site mainly during the construction phase. This will consist of domestic waste from the living activities of the approximately 30 people working on site, excavated soil, wood waste and limited amounts of construction waste.

During the ***operational phase***, it is possible that occasional waste may be generated from repair work on the facilities (metal parts, electronic components, etc., some of which are classified as hazardous). During operation, it is also possible that certain quantities of hazardous waste - lubricating oil from the generators - may be generated.

There is no waste contamination in the area where the investment is to be carried out. No demolition or dismantling of industrial buildings and structures is foreseen during the implementation process.

5.5 Landscape

Following consultation with the competent authority, it has been determined that the main landscape elements will be determined in accordance with Article 30(1)(b). 3 of the Biological Diversity Act:

- Rivers and their banks and ancient riverbeds;
- Natural bogs, ponds, waterlogged meadows and other wetlands;
- Caves, cliffs and dunes;
- Saddles and other natural areas linking individual mountain ranges;
- arable fields, shelterbelts, meadows and pastures;
- Floodplain river terraces and riparian vegetation;
- Forests up to 500 m above sea level.

According to the landscape zoning of the country, the area of the investment project belongs to the North Bulgarian Zonal Area of the Danube Plain, Subarea - Seaside Dobrudzha.

- Class - Flat landscapes;
- Type - Temperate continental steppe, grassland-steppe and wooded-steppe plains;
- Subtype - Black Soil Steppe Plain Landscapes;
- Group - Landscapes of the black loess steppe plains with a high degree of agricultural use.

The topography of the area is dominated by plains interspersed with shallow valleys. Characteristic are lowlands with asymmetrically developed dry valleys facing the Shabla and Durankulak Lakes and the Black Sea. Agricultural (agro) landscapes adjacent to small populated areas (village landscapes) are typical. The natural vegetation is highly altered and is preserved only in very small forest patches around the drylands. The areas covered by the investment proposal are 100% arable land. Roads are the technogenic elements. The landscape aesthetic assessment of the area is good.

The project foresees some changes in the landscape due to the installation of 7 wind turbines. In general, past practice has shown that this type of installation fits relatively seamlessly into the general landscape of agricultural land.

5.6 Biodiversity and its elements

5.6.1 Vegetation

The vegetation of the area, according to the modern geobotanical zoning, belongs to the European Broadleaved Forest Area, Illyrian (Balkan) Province, Ludogorets Subregion.

The area under consideration is part of the Mizian Forest Plant Area and the Dobrudzha Plant Area sub-area. Vertically, the vegetation in the area is represented by belts and preserved natural forests and scrub ecosystems along ravines and gullies. This area includes the lower lowland hilly belt of oak woods. In this belt, there are natural pure and mixed forests of swamp oak /*Quercus frainetto Ter*/, hornbeam /Quercus cerris L/, hairy oak /Q. pubescens Willd./, common and chestnut hornbeam /Carpinus ssp./. In the lower storey there are - honeysuckle /Fraxinus ornus L/., rosehip /Rosa canina L./, hawthorn /Crataegus monogyna Jacq./, bird's-foot trefoil /Ligustrum vulgaris L/, draca /Paliurus aquliatus L/, prickly wild holly /Ruscus aculeatus L./, black elder /Sambucus nigra L./ and others.

Along the dry valleys there are oak woods, less often only oak /Quercus cerris/, more often mixed woods of oak and hornbeam /Carpinus orientalis/, sometimes with holm oak /Fraxinus ornus/. The open spaces are occupied by agricultural land and pastures, covered with xerothermic grasslands with a predominance of white sedge /Dichantium ischaemum/, bulbous meadow-grass /Poa bulbosa/, etc., and less frequently with mesocerothermic herbaceous vegetation.

The natural vegetation in the investment proposal area is of xerothermic (drought tolerant) type, forming grasslands of semi-arid character. The vegetation cover is a complex of herbaceous formations dominated by calcareous species. A characteristic feature is the increased presence of ruderal species. The most common species are the bellwort (Dichantium ischaemum), the bulbous meadow-grass (Poa bulbosa), the false fescue (Festuca

pseudovina), the crested wheatgrass (Agropyron cristatum) and the bare-leaved rush (Stipa capillata). The cereals are crested wheatgrass (Agropyron cristatum), tussock (Cynodon dactylon) and common fescue (Bromus commutatus).

The shrubs include species such as hawthorn (Crataegus monogyna), lilac (Syringa vulgaris), mahaleb (Prunus mahaleb), sloe (Prunus spinosa), dracaena (Paliurus spina-cristi), rose hip (Rosa canina) and others.

There are no developed steppe communities and representatives of protected steppe flora in the area of the facilities. There are no swamps and wetlands.
The nearest steppe communities are located along the Suha Reka Canyon.

The analysis of the current status of the flora and habitats in the project area leads to the following conclusions and recommendations:

- **No rare, endangered and protected plant species and plant communities have been identified in the area of the planned wind farm.**
- **There are no potential habitats of European importance in Bulgaria on the territory of the studied and adjacent plots of land, which are listed in Annex 1 of Art. 1 item 1 (amended, SG No. 88/2005) of the Law on Biological Diversity (SG No. 77 of 09.08.2002), as well as natural habitats listed in Annex I of Directive 92/43/EEC.**

5.6.2. Characteristics of the state of the animal world - Species diversity

Class Mammals (Mammalia).

The mammalian fauna of the investment proposal is generally poorly represented, with isolated specimens of field mouse (*Apodemus agrarius*), blind mole-rat (*Nanospalax leucodon*), brown rat *(Rattus norvegicus*), European hare (*Lepus europaeus*).

Due to the proximity of residential areas, there are no prerequisites for the presence of permanent habitats for large mammals in the investment proposal area. Wild boar (*Sus scrofa*), roe deer (*Capreolus capreolus*), red fox (*Vulpes vulpes*) and badger (*Meles meles*) pass through the area episodically (mainly at night). Large mammals are more common, especially in areas covered by woody and scrub vegetation. The area of the WPP is not important for red deer (*Cervus elaphus*), roe deer (*Capreolus capreolus*) and fallow deer (*Dama dama*). As these are hunted species, their numbers are maintained through restrictions imposed by the Hunting and Game Act.

The most common species in the area are the European hedgehog (*Erinaceus europaeus*), the least weasel (*Mustela nivalis*), the wood mouse (*Apodemus sylvaticus*), the bicoloured shrew (*Crocidura leucodon*) and the lesser shrew (*Crocidura suaveolens*), and the open spaces are inhabited by steppe fauna - common vole (*Microtus arvalis*), steppe mouse (*Mus spicilegus*), European mole (*Talpa europaea*), blind mole-rat (*Nannospalax leucodon*) and European hare (*Lepus europaeus*).

No permanent wildlife corridors have been identified in the area that would be disturbed by the implementation of the investment proposal.

Due to their narrowness and the agricultural activities carried out in the areas between them, as well as the proximity of the populated areas, the grassland belts in the area are more like temporary refuges for the larger mammals that are hunted: red deer (*Cervus elaphus*), fallow deer (*Cervus dama*), roe deer (*Capreolus capreolus*) and wild boar (*Sus scrofa*).

It is probably only in winter, on colder days, that individual larger animals pass through the farmland in search of food, but their presence is rather random. At the start of construction, larger mammals, including game, will move into the larger areas of deciduous forest where they can find undrained water sources throughout the year. Over time, the animals living in the area will become accustomed to the monotonous and constant noise and will come to the area to forage. In this case, the type of crops grown will be of greater importance to the inhabitants of the area and the field belts than the presence of wind turbines. This is evidenced by the fact that in areas with abundant wildlife, wildlife also appears directly on the roads without being disturbed by vehicle noise. In this

case, the number of mammals hunted depends on the hunting activities carried out and the number of offspring shot.

The area is suitable habitat for the European hare (*Lepus europaeus*) and the badger (Meles meles L., 1758). Both species are characteristic of agricultural landscapes and the badger can also be found in farmyards, gardens, apiaries, etc. The badger is nocturnal, so direct encounters during construction and operation are unlikely. It is more likely to be hit by vehicles travelling at high speed on motorways at night. For species of high conservation concern, the following predictions can be made for impacts:

Wolf (*Canis lupus*) has a secretive life, mostly going out at night to find food. During the mating season it chooses a sheltered and secluded place higher in the mountains and near water - a stream, lake, river. Compared to the total area of the state forest holdings in the Dobrich State Forest District, the basic abundance of the species is low. The area is populated, inhabited by people due to the presence of populated areas and the need to carry out activities on agricultural land associated with human presence, and is unsuitable for burrows. The impact on the species in terms of reduction of habitat area and overall abundance will be negligible.

Otter (*Lutra lutra*). A predatory mammal of the Poridae family, whose lifestyle is exclusively associated with waters, especially those rich in fish, from which it is very distant and separated by agricultural land, forests, meadows and populated areas.

Marbled polecat (*Vormela peregusna*). A rare carnivore found in south-eastern Europe and Asia, including Bulgaria, with a rapidly declining range. It lives in open and dry areas. In general, it inhabits steppe deserts and semi-deserts. In Bulgaria it prefers treeless areas, but also inhabits other habitats - forests, wetlands, scrub and along rivers. The distribution of the spotted ferret in a given area depends largely on the presence of salamander colonies, which are its main food source. No signs of activity or rookeries were found within 200 m of the wind turbine sites. The nature of the area as farmland and the lack of adjacent dormouse colonies limits its distribution in the area. The distribution of the spotted ferret is limited in the area due to the widespread distribution of its competitor species, the fox (*Vulpes vulpes*) and jackal (*Canis aureus*).

The other species of high conservation value, bear, wild goat and feral ferret, are not found in this part of the country.

Monitoring of bats in the investment proposal area was carried out in 2010 and spring 2011, covering the breeding season and two migratory periods August-October 2022

Monitoring in 2010 and spring 2011, covering the breeding season and two migration periods

Eleven species were recorded in the area using ultrasonic recording equipment and software - Common pipistrelle (*Pipistrellus pipistrellus*), Nathusius's pipistrelle (*Pipistrellus nathusii*), Serotine Bat (*Eptesicus serotinus*), Common noctule (*Nyctalus noctula*), Lesser noctule (*Nyctalus leisleri*), Parti-coloured bat (*Vespertilio murinus*), Savi's pipistrelle (*Hypsugo savii),* Common bent-wing bat (*Miniopterus schreibersii*), Geoffroy's bat (*Myotis emarginatus*), Mehely's horseshoe bat (*Rhinolophus mehelyi*) and Lesser horseshoe bat (*Rhinolophus hipposideros*).

The habitats associated with the life cycle of bats are functionally divided into the following types in terms of modern conservation biology:

- roosting habitats - habitats where bats spend their resting periods (day and night hibernation) and where reproduction, rearing of young and copulation take place.
- foraging habitats - habitats where they hunt
- flyways - habitats that bats pass through on their way from roost to hunt (commuting flyways) and on their way from one roost to another during seasonal migration (migratory flyways)

In terms of roosts, bat species in Bulgaria are divided into two main groups (after Ivanova 2005)

1. Cave-dwellers: obligate cave-dwellers - year-round inhabitants of only underground shelters and facultative cave-dwellers - breeding mainly in underground shelters, but can also breed in other shelters (most often different types of buildings).

2. Non-cave-dwelling: it is characteristic that a species uses different types of shelters in different seasons: rock-dwelling - in summer they inhabit crevices in rocks, data on their wintering are almost missing,

often also synanthropic; forest-dwelling - in summer they inhabit bushes or different parts of old trees; winter mostly in underground shelters; synanthropic - in summer they inhabit different types of buildings, winter mostly in underground shelters.
The species recorded in the area belong to the synanthropic and facultative cave-dwelling bat species, which inhabit buildings, crevices under bridges and groups of trees.
Facultative cave bats use buildings (attics and old uninhabited buildings) as breeding and summer roosts. These are the attics of unoccupied buildings in nearby populated areas. No impact on this type of refuge is expected.

The construction sites are located in open areas without woody vegetation, which precludes the destruction of old trees with clusters used as roosts and breeding sites for forest bat species.
With regard to the foraging habitats of the bat species recorded in the investment proposal area, the preferred foraging habitats for all species are open water (including slow flowing rivers), riparian woodland, forest edges, forests themselves and synanthropic structures - parks, gardens and areas under street lighting.
According to the bat monitoring report and analysis of all records, individuals **of eleven species were found - Common pipistrelle (*Pipistrellus pipistrellus*), Nathusius's pipistrelle (*Pipistrellus nathusii*), Serotine Bat (*Eptesicus serotinus*), Common noctule (*Nyctalus noctula*), Lesser noctule (*Nyctalus leisleri*), Parti-coloured bat (*Vespertilio murinus*), Savi's pipistrelle (*Hypsugo savii)*, Common bent-wing bat (*Miniopterus schreibersii*), Geoffroy's bat (*Myotis emarginatus*), Mehely's horseshoe bat (*Rhinolophus mehelyi*) and Lesser horseshoe bat (*Rhinolophus hipposideros*).**
The conservation status of the bat species considered for the implementation of the investment proposal is as follows:

Table 5.6.2-1 Conservation status of bat species considered for the implementation of the investment proposal

№	Type	Annex 3 to BDA	Annex 2 to BDA
1	Common pipistrelle (*Pipistrellus pipistrellus*)	+	-
2	Nathusius's pipistrelle *(Pipistrellus nathusii)*	+	-
3	Serotine bat *(Eptesicus serotinus)*	+	-
4	Common noctule (*Nyctalus noctula*),	+	-
5	Lesser noctule (*Nyctalus leisleri*)	+	-
6	Parti-coloured bat (*Vespertilio murinus*)	+	-
7	Savi's pipistrelle *(Hypsugo savii)*	+	-
8	Common bent-wing bat (*Miniopterus schreibersii)*	+	+
9	Geoffroy's bat (*Myotis emarginatus*)	+	+
10	Mehely's horseshoe bat (*Rhinolophus mehelyi*)	+	+
11	Lesser horseshoe bat (*Rhinolophus hipposideros*)	+	+

Results of bat monitoring conducted in 2022.
The number of recordings made by the ultrasonic detectors was 54,000, of which over 14,000 were of bat sounds. Software - Kaleidoscope Pro Analysis - was used to analyse the sounds, automatically highlighting recordings where a bat sound was recorded. In addition, a member of the team carried out a detailed review of each recording to compare the results obtained by the software. The recordings reported by the noise software were also checked to ensure that no bat recordings were missed. The sounds of each bat species have certain characteristics that make them different. Based on these characteristics, expert judgement and literature data (Guide to the identification of bat sounds (2015) and Bat calls of Britain and Europe (2021)), the recorded sounds were identified to which species they belonged. Although the software has automatic settings to determine which sound belongs to which species, this functionality has not been adapted for Bulgaria, so each sound was considered and determined individually.
Species with similar ultrasonic characteristics were selected based on literature data and previous studies. This is the case, for example, for the identification of *Miniopterus schreibersii*.
Species with similar ultrasonic characteristics are grouped together. The following groups were created: *Rhinolophus spp. Myotis spp. Plecotus spp. Pipistrellus spp. and Nyctalus spp.*
The group Rhinolophus spp. includes the species *Rhinolophus hipposideros, Rhinolophus euryale, Rhinolophus mehelyi*.
The Myotis spp. group includes the species *Myotis bechsteinii, Myotis alcathoe, Myotis brandtii, Myotis*

capaccinii, Myotis daubentonii, Myotis emarginatus, Myotis myotis, Myotis mystacinus, Myotis nattereri.
The Plecotus spp. group includes the species *Plecotus auritus, Plecotus austriacus* and *Barbastella barbastellus*. Plecotus auritus is a species that occurs at high altitudes and can therefore be excluded as a possibility.
The Pipistrellus spp. group includes the species *Pipistrellus kuhlii* and *Pipistrellus nathusii*.
The group Nyctalus spp. includes the species *Nyctalus noctula, Nyctalus leisleri, Nyctalus lasiopterus, Vespertilio murinus, Eptesicus serotinus, Eptesicus nilssonii*. *Vespertilio murinus* is very unlikely to occur in the study area as it is a boreal species. Eptesicus nilssonii is also very likely to be present, as it was last recorded in Bulgaria in 1980.
The species *Rhinolophus ferrumequinum, Miniopterus schreibersii, Hypsugo savi* are defined individually as they have characteristic features in the sounds they produce. *Rhinolophus ferrumequinum* produces ultrasonic sounds with a peak frequency of 77 to 86 kHz. The sounds of *Miniopterus schreibersii* can be confused with those of *Pipistrellus pipistrellus and Pipistrellus pygmaeus*, but the extreme and peak frequency values of *Miniopterus schreibersii* are more continuous. *Miniopterus schreibersii* produces sounds at shorter intervals than Pipistrellus species. *Hypsugo savi* produces sounds similar to *Pipistrellus kuhlii and Pipistrellus nathusii*. In open areas, such as the study area, this species produces constant frequency sounds of long duration (longer than 10 ms), whereas the above species do not produce sounds of duration longer than 10 ms.
The most common groups and species of bats:
Pipistrellus spp. - *Pipistrellus kuhlii and Pipistrellus nathusii*. *Pipistrellus kuhlii* - inhabits industrial and residential buildings. Feeds around lamps, over farmland. *Pipistrellus nathusii* - uses buildings, rock crevices for shelter. Migratory species;
Miniopterus schreibersii - cave species, but also inhabits buildings. The seal cave may be one of the reasons for the large number of records of this species;
Nyctalus spp. - Nyctalus noctula, Nyctalus leisleri, Nyctalus lasiopterus, Vespertilio murinus, Eptesicus serotinus, Eptesicus nilssonii. Nyctalus noctula - migratory species, inhabits buildings, tree trunks. Nyctalus leisleri - migratory species, inhabits bushes and tree crevices. Nyctalus lasiopterus lives in forests, can be found in rock crevices, buildings, feeds far from its shelter. Eptesicus serotinus - most commonly found in buildings, shelters and rocky areas, with a flying height of about 10-15 metres. Eptesicus nilssonii lives in forests and caves. Vespertilio murinus migratory species, shelters in forests, also uses buildings.
Myotis spp. - Myotis bechsteinii, Myotis alcathoe, Myotis brandtii, Myotis capaccinii, Myotis daubentonii, Myotis emarginatus, Myotis myotis, Myotis mystacinus, Myotis nattereri. Myotis bechsteinii. Myotis bechsteinii forest species, can travel about 35 km. Myotis alcathoe, uses trees as roosts. Myotis brandtii, a woodland bat, also uses buildings as roosts. Myotis capaccinii, a cave bat, uses various shelters in summer and winter. Myotis daubentonii - a woodland bat that can travel up to 150 km between summer and winter refuges. Forages over water, in and along forests. Myotis emarginatus inhabits caves and buildings and hunts over bushes, trees and water. Myotis myotis , a cave-dwelling species that migrates between its winter and summer refuges, can travel over 200 km. Myotis mystacinus uses bushes and under the bark of trees for shelter, and caves and mine tunnels in winter. Myotis nattereri uses tree holes, under the bark of trees, hibernates in water caves and storage crevices. Three of the species belonging to two of the sound groups are migratory (*Nyctalus leisleri, Nyctalus noctula, Pipistrellus nathusii*). There is insufficient research on the migration of bat species in Bulgaria, therefore we cannot claim the proximity of the investment project area to a migration corridor. The highest number of records of these groups is in September, when their migration starts. There are also relatively high numbers of records in August, when these species are not migrating. The fewest records occur in October when the migration is coming to an end. According to NatureScot guidelines (Appendix 3), species of the genera Rhinolophus, Plecotus and Myotis are at low risk of collision with a wind turbine based on their physical and behavioural characteristics. For the species Eptesicus serotinus and Barbastella barbastellus, the risk is medium. The species *Nyctalus noctula, Nyctalus leisleri and Pipistrellus nathusii* are at high risk. The species Miniopterus schreibersii, Pipistrellus, Hypsugo savii are not categorised. According to our expert assessment, *Miniopterus schreibersii and Pipistrellus spp.* fall into the high collision risk group, *Hypsugo savii* - low, but as there are no specific observations of these species in Bulgaria, our assumption cannot be supported by the scientific literature for Bulgaria.

Conclusion from the bat monitoring carried out
Monitoring of bats in the investment proposal area was carried out in 2010 and spring 2011, covering the breeding season and two migration seasons, with monitoring from August-October 2022.

During this 10-year period, three species recorded in 2010-11 were not observed during the last survey and seven other species were new to the study area.

Type	2010-11	2022
Barbastella barbastellus	yes	no
Eptesicus nilssonii	yes	no
Eptesicus serotinus	yes	yes
Hypsugo savii	yes	yes
Miniopterus schreibersii	yes	yes
Myotis daubentonii	yes	no
Myotis sp.	-	-
Nyctalus leisleri	yes	yes
Nyctalus noctula	yes	yes
Pipistrellus kuhlii	yes	no
Pipistrellus nathusii	yes	yes
Plecotus auritus	yes	no
Plecotus austriacus	yes	no
Rhinolophus ferrumequinum	yes	no
Rhinolophus hipposideros	yes	yes
Vespertilio murinus	yes	yes

Of the three species recorded in 2011, Brown Bat (Pipistrellus pipistrellus), Tri-coloured Nightjar (Myotis emarginatus) and Mehely's Horseshoe Bat (Rhinolophus mehelyi) were not recorded in the 2022 monitoring. Any increase in species diversity is likely to be due to advanced technology and netting.

Reptiles and amphibians

Scrubland and dry grasslands are natural habitats for reptiles: the most common lizards in the area are the wall lizard (Podarcis muralis) and the Crimean lizard (Podarcis taurica), and the most common snakes are the gopher snake (Dolichophis caspius) and the viper snake (Vipera ammodytes). Artificial ponds, small streams and wet ravines are inhabited by the yellow-eared water snake (Natrix natrix) and the grey water snake (Natrix tessellata).The area is dominated by arable land and representatives of terrestrial turtles - the spur-thighed turtle (Testudo graeca) and the spur-tailed turtle (Testudo hepmanni) are very rare. The area is dominated by arable land which, due to its cultivation and proximity to human populated areas, has in the past destroyed a significant proportion of the tortoises in the area.

The lack of natural vegetation and scrub, which is the natural habitat of these two species, limits the possibilities for their colonisation in the areas planned for the installation of wind towers and cable routes.
These reptiles spend most of their lives in a small area and very rarely migrate. Due to their lifestyle and limited mobility, natural exchange of individuals between populations separated by a physiographic barrier (e.g. major river, high ridge, motorway) is virtually impossible.
The area of the proposed investment will be repeatedly crawled within a radius of 1 km from the location of each wind tower. No tortoises of the species Hermann’s Tortoise (Testudo hermanni) and Greek Tortoise (Testudo gracea) were found during the crawling, daily monitoring and surveys.

In the maps of the distribution of turtles in Bulgaria presented above, the result of Beshkov's research, the area of the Investment Proposal - North-East Bulgaria is presented as an area where their distribution is limited.

Their population density in the area is less than 1 per decare and will not be affected by the implementation of the investment proposal. In the above maps of the distribution of turtles in Bulgaria, the result of Beshkov's research, the area of the Investment Proposal - North-East Bulgaria is presented as an area where their distribution is limited.

The two species of turtles - the Greek tortoise and the Hermann’s tortoise (*Testudo graeca, Testudo hermanni*) and the snakes - the Caspian whipsnake (*Dolichophis caspius*), the viper (*Vipera ammodytes*) and the dice snake (Natrix *tessellata*) are included in the appendices of the Biodiversity Act (BDA).

No specimens of Testudo graeca (Greek tortoise), Testudo hermanni (Hermann’s tortoise) or snakes were found during the repeated surveys of the WPP area.

Amphibians mainly inhabit gorges and micro-dams created for irrigation purposes. Slow-flowing and stagnant ponds are important for fertilisation and the passage of the larval stage, and adults of some frog and opossum species can be seen at a considerable distance in wooded meadows, including in small populated areas.

The Danube region has the highest diversity of amphibians in Bulgaria - 18 species.

The wetlands, mainly the drying Vaklinovski dol, which reaches Durankulak Lake, and the constructed micro-dams are habitats for amphibians, as the fire salamander (*Salamandra salamandra*), the common (lesser) newt (*Lissotriton vulgaris*), the Northern crested newt (*Triturus cristatus*) and the Southern crested newt (*Triturus karelinii*) are reported from the area (Biserkov et al, 2007). The Danube crested newt (*Triturus dobrogicus*) is found only in the adjacent area of the Danube in the Dobrudja region.

Non-game amphibians in the Dobrudzha region include the Tree Frog (*Hyla arborea*), the Agile Frog (Rana dalmatina), the European fire-bellied toad (*Bombina bombina*), the Green Toad (*Pseudepidalea viridis*), the Brown (Bufo) Toad (*Bufo bufo*), the Marsh Frog (*Pelophylax ridibundus*), the Edible Frog (*Pelophylax kl. Esculentus*), the common spadefoot (*Pelobates fuscus*) and the Syrian spadefoot (*Pelobates syriacus*). Some of these, such as two species of spadefoot are found only in the adjacent rivers. Danube-Black Sea strips or isolated localities.

Snakes *(Serpentes)* and Lizards *(Sauria).*

16 species of snakes and 13 species of lizards have been recorded on the territory of the Republic of Bulgaria. Some of them are very rare species and others are found only in certain regions of the country. The investment project will be implemented on the territory of arable land, away from the uncultivated areas, therefore the snake representatives may accidentally fall into the plots where the construction will take place. In the past, when arable land was fragmented by sinuosities, gaps and numerous tracks, they were common in arable land, but with encroachment, intensification and the use of powerful tillage machinery, snakes have been driven out of their natural habitats with conversion to arable land and are now mainly found in grassland adjacent to woodland and scrub. Suitable snake habitat exists in windbreaks, but these are outside the reach of construction and are fragmented by roads.

The Grass Snake (*Natrix natrix*) and the Dice Snake (*Natrix tessellata)* inhabit man-made ponds in the area and wetlands along small streams. For these reasons, no impacts are expected from the implementation and operation of the proposed investment. Less sensitive are the lizards, which are ubiquitous in the area.

The area was searched for snakes during the crawl, but none were found. The density of their populations is less than 1 per decare.

Populations of snakes of the family Smokovidae and the family Venomidae have a very low density.

All amphibians have a high conservation status and are listed in one of the Bern Convention Appendices. Many are also protected under the Nature Conservation Act. The two glabrous relict Syrian garlic sculpins are listed in the Red Data Book. The habitats of 5 species of Danube crested newt (*Triturus dobrogicus*), northern crested newt (*Triturus cristatus*), southern crested newt (*Triturus karelinii*) and fire-bellied toad (*Bombina bombina*) are protected under Appendix 2 of the Bern Convention. The three aquatic frog species listed in Annex 4 of the BDA are subject to use restrictions.

Invertebrate fauna:

The invertebrate fauna of Dobrudja includes typical steppe elements (centipedes, grasshoppers).

The most abundant insects are the Beetles (*Coleoptera)*, which make up about 40% of the insect fauna. The most common are click beetles (*Elateridae*), whose larvae live in the soil, true weevils (*Curculionidae*), scarabs (*Scarabeidae*), represented by Maybug (*Melolontha melolontha*), June beetles (*Rhisotrogus aequinoctalis*) and green beetles (*Anomalasolida*), ladybirds (*Coccinellidae*) and jewel beetles (*Buprestidae*). In the overgrown areas among the fallen trees, we find the great capricorn beetle (*Cerambyx cerdo*) and the stag beetle (*Lucanus cervus*), whose larvae feed on dead wood.

Among the butterflies (*Lepidoptera)*, moths are the most common and are characteristic of arable land, in windbreaks in deciduous forests the gypsy moth (*Lymantria dispar*) and in coniferous plantations the pine processionary moth (*Traomatocampa pityocampa*).

5.6.2.1. Birds

Number of soaring birds

The total number of birds recorded during the three field seasons was 54 617, of which 2275 were waterfowl (storks, pelicans and cranes) and 4878 were birds of prey. -birds of prey. The most abundant waterbird species was the White Stork with 1127 individuals, mainly observed in autumn 2004. The second most common species was the Pink Pelican (*Pelecanus onocrotalus*) with 915 individuals.

Among the birds of prey, the most abundant species were the Common Buzzard (3186 individuals - 1026 in 2004, 11 in 2005 and 2149 in 2009), the Red-footed falcon (336 individuals - 186, 45 and 105 respectively), the Lesser Goshawk (316 individuals - 171 in 2004 and 145 in 2009) and the Black Kestrel (265 individuals - 56, 14 and 195 respectively).

Table 5.6.2.1-1. Gorichane village

Group	Autumn 2004	Spring 2005	Autumn 2009	Spring 2020	Autumn 2019	Spring 2022	Autumn 2021
Total birds of prey	1877	117	2885	91	690	314	628
Total storks, pelicans and cranes	1934	67	274	5	23	18	97
Total soaring	3811	184	3159	96	1167	332	725
Other birds	1176	871	45416	4345	11292	3782	9039
Total	4987	1055	48575	4441	12459	4114	9764

Comparing the numbers of migrants from the two autumn migrations - 2004 and 2009 - there are significant differences in total numbers. Nearly 10 times as many migrants were seen in 2009, but as can be seen these are not soaring birds and 2019-20 is similar to 2004-5.

There are two main migration corridors during the autumn migration: north-east-south-west and north-south. In 2004, 75.8% of the birds flew along these two routes and in 2009, 69.9%.

No globally threatened bird species nest or occur in the study area.

The area has the highest concentration of Garden Wren and Thick-billed Lark in Bulgaria.

The proximity of Shabla Lake determines the presence of birds, mainly geese, in the area during all winter months.

Two globally threatened species - Red-breasted Goose and Saker Falcon - were observed in the study area and it was found that the abundance of the former species is high outside the area of the planned wind farms. Over 80% of all feeding and passage birds were found east of Gorichane, with no conflict with the proposed facilities. The second species was not recorded on the site of the proposed wind farm.

The WPP is not located on agricultural land with high or even medium forage quality for wintering red-breasted geese.

5.7. Physical nuisances (noise, vibration and electromagnetic radiation)

The main harmful physical factors are noise and, to a much lesser extent, electromagnetic radiation.

Noise and acoustic environment

Mechanical vibrations with a frequency of 16 to 20,000 Hz that propagate in an elastic material medium (usually air) and cause auditory sensations are called sound. Noise is any unpleasant or undesirable sound that disturbs rest and relaxation or is detrimental to health, causing a variety of functional and structural impairments, reduced performance, impeded speech communication and perception of environmental sound signals. From a hygienic and psycho-physiological point of view, tones (sounds of a certain frequency) are also classified as noise when they have a harmful effect on the human organism.

Noise, vibration and electromagnetic radiation - environmental status

No permanent noise surveys and measurements have been carried out in the municipality. The main source of noise is road traffic. It can only pose a health risk at certain points where there is significant traffic congestion and a high volume of motor vehicle traffic, and only for a limited period of time. Traffic noise is followed by domestic noise and, at the lowest level, construction noise.

For Gorichane and Prolez, the limiting equivalent noise levels are 55, 50 and 45 dB(A) during the day, evening and night respectively.

The levels of electromagnetic radiation, as far as they have been measured incidentally in the area, are at normal levels, and they are higher in the easements of the power transmission networks and the down/up power stations and telecommunications facilities of mobile operators.

5.8. Health risk to the public and workers on site

Due to the significant distance of the wind turbines from the nearest health sensitive areas, there is virtually no population potentially affected by this wind farm. Therefore, there is no need to discuss the health status of the affected population.

There is no information on the health status of the population of the nearest populated areas - villages Gorichane and Prolez. As this EIA report deals with the imminent implementation of an investment proposal, it is clear that past impacts of this proposal cannot be sought. Potentially, such impacts could be sought once the site is operational.

The repealed Regulation of the Ministry of Health No. 7 on hygienic requirements for health protection of the residential environment [(promulgated, SG No. 46 of 1992; amended and supplemented, SG No. 46 of 1994; amended and supplemented, SG No. 89 and SG No. 101 of 1996; amended and supplemented, SG No. 101 of 1997 and SG No. 20 of 1999)] does not regulate a hygienic protection zone for this type of object. Therefore, until now the procedure according to Art. 6 par. 1 of the Regulation, i.e. the Hygiene protection zone is determined by the Ministry of Health.

At this stage, the guidelines set out in Art. 1 of Ordinance No. 14 of 15 June 2005 on technical rules and regulations for the design, construction and use of sites and installations for the generation, conversion, transmission and distribution of electricity - according to which the minimum distance from the nearest inhabited area must be at least 500 m.

The minimum setbacks of wind turbines from the populated area regulations are given in Section 1.4. The RHI-Dobrich and the MoH have issued opinions on the siting of the wind turbines.

The investment proposal does not provide for overhead lines (OL) and open switchgear (OS), therefore the requirements of Annex 2 to Art. 3 of the above-mentioned Regulation No. 7 and Regulation No. 16 on easements for energy facilities (published in the Government Gazette No. 88 of 2004).

5.9. Cumulative effect with other investment proposals in the area

The definition of cumulative effect is given in the REGULATION on the conditions and procedure for assessing the compatibility of plans, programmes, projects and investment proposals with the subject and objectives of the conservation of protected areas, approved by Decree No. 201 of 31.08.2007, SG No. 73 of 11.09.2007, in force from 11.09.2007, amended and supplemented by No. 81 of 15.10.2010, in force from 15.10.2010.

"Cumulative effects" are effects on the environment that result from the incremental effect of the plan, programme and project/investment proposal under consideration when added to the effects of other past, present and/or anticipated future plans, programmes and projects/investment proposals, regardless of who implements those plans, programmes and projects/investment proposals. Cumulative effects may result from individual plans, programmes and projects/investment proposals which, when considered individually, may have a negligible effect, but which, when considered as a whole and implemented repeatedly over a period of time, may have a significant effect.

After receiving and considering the requested additional information on the status of the investment proposal from the Regional Inspectorate for Environmental Protection and the Municipalities of Kavarna and Shabla, the cumulative effect has been reassessed and only the investment proposals for wind energy plants are included in the cumulative effect assessment. The wind energy projects in Dobrudja, and in particular in the municipalities of Kavarna and Shabla, do not affect priority habitats included in the Natura 2000 network. Exceptions are the wind turbines already built on the Kaliakra Cape - 35 wind turbines and between the town of Kavarna and the village of Balgarevi - 8 pieces.

According to the Ministry of Environment's opinion on EC No. 1-2/2012, a ban will be introduced until 2020 to conduct new procedures under the Environmental Protection Act and the Biological Diversity Act for wind turbines falling within the boundaries of protected areas of the Natura 2000 network.

In relation to the nature of the investment proposal under consideration, a possible cumulative effect on birds and bats passing through the area of the wind farm can be expected.

It is important to note an amendment to the Environmental Protection Act - Article 93, paragraph 8 provides for the validity of a decision to carry out an EIA - 5 years in the case of construction not started. Thus, 2883 wind turbines with decisions issued between 2004 and 2008 are subject to further assessment. Many of these have not yet been built and may be subject to EIA due to changes in the actual situation - wind farms already built, cumulation, barrier effect, etc.

Another circumstance is the adoption of the National Renewable Energy Action Plan 2011 - 2020 and the Opinion on the Environmental Assessment of the Ministry of Environmental Protection No. 1-2/2012, which imposes conditions and measures on new renewable energy projects. According to point 1.3.2 of the Opinion, a ban on new proceedings under the Environmental Protection Act and the Nature Conservation Act (for which no proceedings had been initiated as of the date of the Opinion - 8 August 2012) is introduced for wind turbines in the Dobrich region and at a distance of less than 2 and 6 km from the SPA for the protection of wild birds. According to the opinion, no new procedures will be allowed in the Dobrudja geographical area until 2020, so the cumulative effect will not increase.

Situation in Shabla Municipality.

In Shabla Municipality there are currently 44 enterprises. The total area of the municipality is 329.64 square kilometres. Accordingly, there are 7.5 km2 per operating generator.

The future situation and assessment of the cumulative effect of wind energy development in the region from the pending but not yet implemented investment plans for 264 wind turbines is the worst possible scenario to be expected. The total land area of the Shabla municipality is 329.64 square kilometres. Therefore, if all 264 wind turbines were to be built (which is unlikely), there would be 1.1 square kilometres per wind turbine. Of these 264 wind turbines, 123 are in the EIA process or have an EIA decision in force, taking into account cancelled and expired EIA decisions. If all 123 feasible IPs are implemented, together with the investment proposals already implemented, there will be an area of approximately 2.0 square kilometres per generator.

The spatial extent of cumulative impacts for the different components and factors of the environmental footprint also varies. For ambient air, it is up to 100 m from the construction site and along road routes directly related to traffic. For soils, the spatial extent is the directly affected area. For birds, the footprint is the largest. For noise, it has been decided in consultation with the competent authority to take into account the cumulative impact of other

wind turbines within a radius of 2.5 - 3 km of the wind farm under consideration. The same zone has been adopted for landscape, based on the angle of view of the wind turbines. In the 'Physical nuisance' section, a map showing the wind turbines under consideration and other wind turbines is presented, and a 3 km zone around the contour of the wind farm is drawn, which is considered to be reliable with regard to the cumulative effect of the wind turbines located within it.

It should also be noted that, as a result of changes in the legal framework, many of the investment proposals submitted will be reconsidered and some will not be implemented in the foreseeable future, if at all.

The cumulative impact assessment is carried out at three levels:

- Local - the territory of the villages of Gorichane and Prolez, where the wind farm in question is located, according to the area defined by the landscape and natural characteristics of the environment;
- Municipal - the municipality of Shabla, which in turn covers the northern coast of Primorska Dobrudja;
- on a large regional scale - the majority of Dobrudja, Dobrich region - municipalities Dobrich, General Toshevo, Krushari, Tervel, Kavarna, Balchik.

After consultations with experts from the Regional Inspectorate for Environmental Protection of the city of Varna, MESV, Shabla Municipality and Dobrichka, General Toshevo, Krushari, Tervel, Kavarna and Balchik Municipalities, we have summarised all the investment intentions for the construction of wind turbines that could have a cumulative effect on the territory of the Dobrich region as of 11.08.2022.

Table 5.9-1 – Cumulative effect

Land area/Municipality	Processed wind turbines, pcs	Constructed wind turbines, pcs	With expired EIA Decision or cancelled Decision	In progress / with EIA decision in force
Prolez and Gorichane	141	11*	94	36*
Shabla / without Prolez and Gorichane/	167	20	47	100
Kavarna Municipality	852	261	343	248
Balchik Municipality	423	26	308	89
Municipality Gen.Toshevo	518	10	319	189
Municipality Dobrichka	422	10	242	170
Dobrich Municipality	2	None	2	None
Krushari Municipality	267	None	213	54
Tervel Municipality	136	None	75	61
Total	**2928**	**338***	**1643**	**947***

*Satellite images show that 24 wind turbines have been built on the land of the villages of Prolez and Gorichane, from which we conclude that the information provided by Shabla Municipality and Varna Regional Environmental Protection Agency - Decision No. 07/11.08.2022 under the EIA Act for wind turbines with EIA decisions in force does not take into account that 13 of them are already built. Accordingly, 23 wind turbines remain in the EIA procedure or with EIA decisions in force on the territory of the villages of Prolez and Gorichane, but not yet built, the total number of wind turbines

implemented in the Dobrich region is at least 351, and the total number of wind turbines in the EIA procedure or with EIA decisions in force is 934.

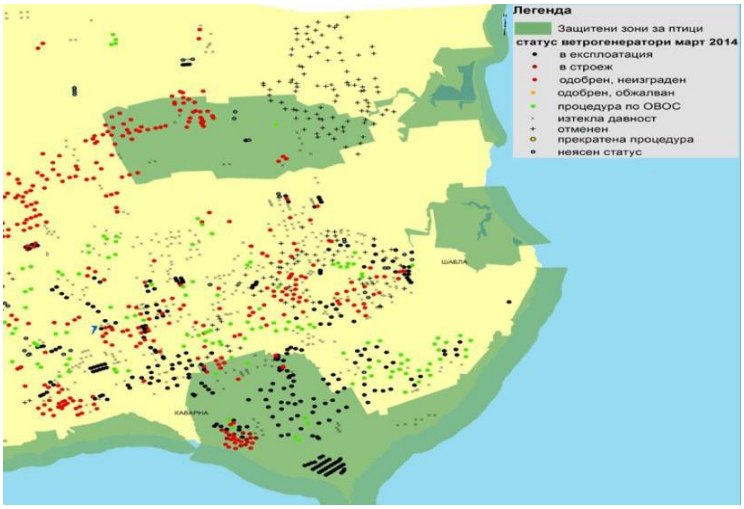


Fig. 5.9-3 Wind energy facilities /Source - Report "Analysis of the development of the wind energy sector in Bulgaria as of 2014", developed within the project LIFE09/NAT/BG/00230/

The total number of all wind energy installations on the territory of the Dobrich region declared to the Regional Inspectorate for Environmental Protection in Varna and to the municipalities as of 11.08.2022 is 2 928. This includes the 7 wind turbines of the Prolez WPP.

It is worth noting an amendment to the EIA - Article 93, paragraph 8 provides for the validity of a decision not to carry out an EIA - 5 years in the case of construction not started. By 2022, EIA decisions for 10 wind turbines have been cancelled, but in practice for 1633 wind turbines the EIA decisions are still not valid due to the statute of limitations /and even though they have not been cancelled, no realisation can take place on the basis of them/.

In conclusion, a total of 2928 wind turbines have been designed in the geographical area of "Dobrudzha", of which:

- 351 have been constructed;
- with cancelled EIA decisions for which the procedure is not continued or with expired EIA decisions - 1643 turbines;
- in the process or with an EIA decision in force - 934 turbines.

The cumulative impact analysis evaluated two options:

- **For all the investment projects that have been applied for/processed, regardless of the fact that they have been rejected by the RIEW Varna or that there are cancelled decisions;**
- **for all implemented and realisable wind energy plants /built wind energy plants, those with completed EIA procedures and valid decisions and those in EIA procedures/, including in the areas of the villages affected by this IP and in the geographical area of Dobrudzha.**

Fig. 5.9-4. Installed wind turbines in the Kaliakra protected area

- **<u>Data used to calculate the cumulative effect on a wide regional scale /Dobrich region/</u>**

The cumulative effect is considered for the whole Dobrich region or almost the whole Dobrudzha (Fig. 5.9-5.), as the area covers the full width of the Western Black Sea flyway - Via Pontica (Michev et al., 2012).

The specified area of cumulative impact (Fig. 2.5) includes the municipalities of Dobrich, Dobrich, General Toshevo, Krushari, Tervel, Kavarna, Shabla, Balchik, and is an area more than 80-100 km from the outer boundary of the investment proposal. It covers almost the entire territory of these municipalities with a total area of 4 719,7 km2.

In the eight municipalities, 2928 wind energy plants have been applied for so far, of which 351 plants have been constructed and 934 plants are in the process or have an EIA decision in force, taking into account cancelled or expired EIA decisions. This means that at present there is an area of 13.4 square kilometres per wind turbine in operation, and with the implementation of all wind turbines (implemented and realisable) there will be an area of 3.7 square kilometres per wind turbine.

With the eventual implementation of 2928 pcs of wind turbines (although not feasible), each wind turbine would account for 1.6 sq km per wind turbine.

- **Data for the calculation of cumulative effects at the local level**

Mainly in the two affected areas, Prolez and Gorichane, there are currently 141 wind turbines approved and under processing, according to the available information provided by the Municipality of Shabla, Regional Environmental Protection Agency Varna - Decision No. 07/11.08.2022 under the Environmental Impact Assessment Act. Most of them are located on the territory of the village of Gorichane. Of these, 24 have been constructed and of the 117 that have been under consideration but not yet constructed, 23 are in the process of EIA or have an EIA decision in force, taking into account cancelled or expired EIA decisions. This means that the implemented and feasible IPs total 47 wind turbines.

The estimated 47 wind turbines, including the 24 already constructed, are expected to have a cumulative impact on an area of 42.86 km2 or one generator on an area of 0.9 km2.
If all IPs are implemented, which is unlikely, there will be an area of about 0.3 km2 per generator.

Figure 5.9-7 Some of the old pre-2011 wind energy installations and new ones in the area of Gorichane and Prolez villages.

- **Data used to calculate cumulative impact within Shabla municipality**

Table 5.9-1 and the note to it show that there are 44 wind turbines built and 308 wind turbines under construction in the municipality. Of the 264 under construction but not yet built, 123 are in the EIA process or have an EIA decision in force, taking into account cancelled or expired EIA decisions.

The total area of the municipality is 329.64 km2. Correspondingly, there is 7.5 sq km per commissioned generator, and with the construction of all feasible and implemented IPs, there will be an area of about 2.0 sq km per generator.

If all IPs are implemented, which is unlikely, there will be an area of about 1.1 km2 per generator.

As shown in the National Renewable Energy Action Plan Compatibility Assessment, the spatial distribution of wind capacity is very uneven across the country (Figure 5.9-9).

The largest number of wind turbines is concentrated in Dobrudzha, where 54% of all approved and planned wind turbines are located and where the installed capacity (of approved and planned wind turbines) is at least 4540.35 MW from 3113 wind turbines.

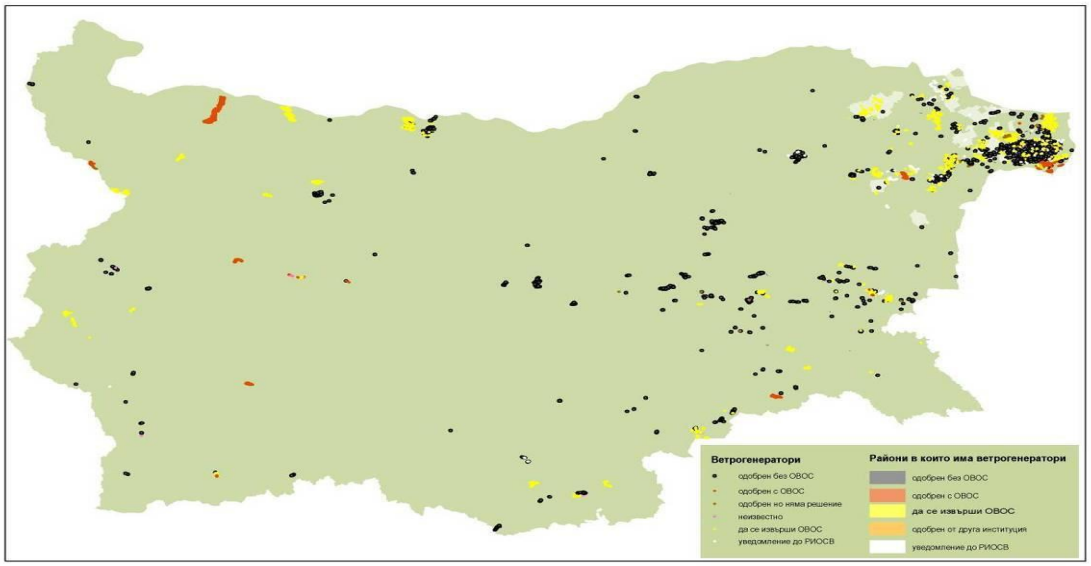


Figure 5.9-9. - Wind power capacity at national level

6. Description, analysis and assessment of the likely significant impacts on people and the environment as a result of: Implementation of the investment proposal, use of natural resources and emissions of pollutants in normal and emergency operation, generation of waste and creation of nuisances

6.1. Potential impacts on ambient air

The impacts on the ambient air during the different phases of the project implementation will be related to the emission of fugitive emissions, including exhaust gases from construction machinery, specialised heavy-duty vehicles and particulate matter.

6.1.1. Emissions during construction

The main impact on air quality is expected to occur during the construction period of the wind farm and associated infrastructure. Dust and exhaust emissions from construction machinery are identified as the main pollutants during this period, with limited quantitative and qualitative potential.

According to the EMEP/CORINAIR Emission Inventory Guidebook 2005, the pollutants included in the exhaust emissions from diesel-powered transport and construction equipment include NOx, VOC, CH4, CO, CO2, N2O, Cd, Pb, PAH, PM, DIOX, PCB.
The air quality in the area of the investment project will be affected by:

- Dust emissions from construction machinery during the processes of vertical design, foundation and construction of the wind turbines and related infrastructure (excavation, embankment, grading, alignment, etc.);
- Particulate emissions from heavy goods vehicles travelling on unpaved roads on the site;
- Dust generated during the temporary storage of earth masses in the open air;
- Separation of exhaust gases from construction machinery and heavy goods vehicles.

6.1.1.1. Impact of construction mechanisation in the modelling and vertical design of the site, foundations and construction of supporting infrastructure (excavation, embankment, valorisation, alignment, etc.)

During the implementation of the vertical planning and shaping of the site for the construction of the wind turbines and the supporting infrastructure, earthworks will be carried out, which are accompanied by intensive dust emissions. The level of dust will depend on the terrain on which the work is to be carried out and the weather conditions in the area. The site under consideration is characterised by an earthen base consisting of a thick layer of soil overlying bedrock.

In this respect, dust emissions to the atmosphere may reach high levels during the construction phase, but given the geomorphological characteristics and dynamic meteorological conditions, any negative impact on nearby urban/residential areas is excluded.

Figure 6.1.1-1. Dust generated by a dump truck on a gravel road

In addition, there is no existing infrastructure on the site and demolition (breaking up) of asphalt and concrete pavements is not expected.

Given the existing circumstances, contamination is expected to be local in nature with an assumed impact distance of up to 100 m from the source.

6.1.1.2. Impact of construction fumes from machinery and heavy vehicles

The use of heavy and construction machinery on the site, on the process roads and on the national road network is a major contributor to the change in air quality. The pollutants emitted by the engines in the form of exhaust gases (nitrogen oxides, carbon monoxide, sulphur oxides, soot, light organic compounds) and particulate matter form the basis for the pollution of the near-surface layer of the atmosphere in the area under consideration and the adjacent contact zones.
The main source affecting air quality has been identified as traffic on the temporary process roads and the area allocated for the construction of the wind turbines.

6.1.1.4-1. Emissions from area sources

It is expected that a significant part of the construction works, such as excavation, embankment, vertical earthworks, concreting of the foundations and delivery of the wind turbines, will be carried out with construction machinery, including:

- Excavator - type RH -25 - 1 piece - power 250 kW, consumption 25 l/hour (diesel), work per shift - 4.5 hours;
- Concrete truck - 1 piece - power 150 kW, consumption 20 l/hour (diesel), work per shift - 4.0 hours;
- Bulldozer - type T130M - 1 piece - power 130 kW, consumption 17 l/hour (diesel), working shift - 4.0 hours;
- Dump truck (KRAZ/KAMAZ 5511) - 1 piece (1 reserve) - 100 kW (lifting capacity 13

tonnes), consumption 20 l/hour (diesel), shift work - 5.0 hours;

- Tractor for heavy oversized loads - 1 piece - power 500 kW, consumption 25 l/h (diesel), shift work - 4.0 hours.

AMBIENT TRAFFIC

1. Route "International Road I.9: Durankulak-Varna-Burgas-M. Turnovo", in the ring roadof the town of Shabla

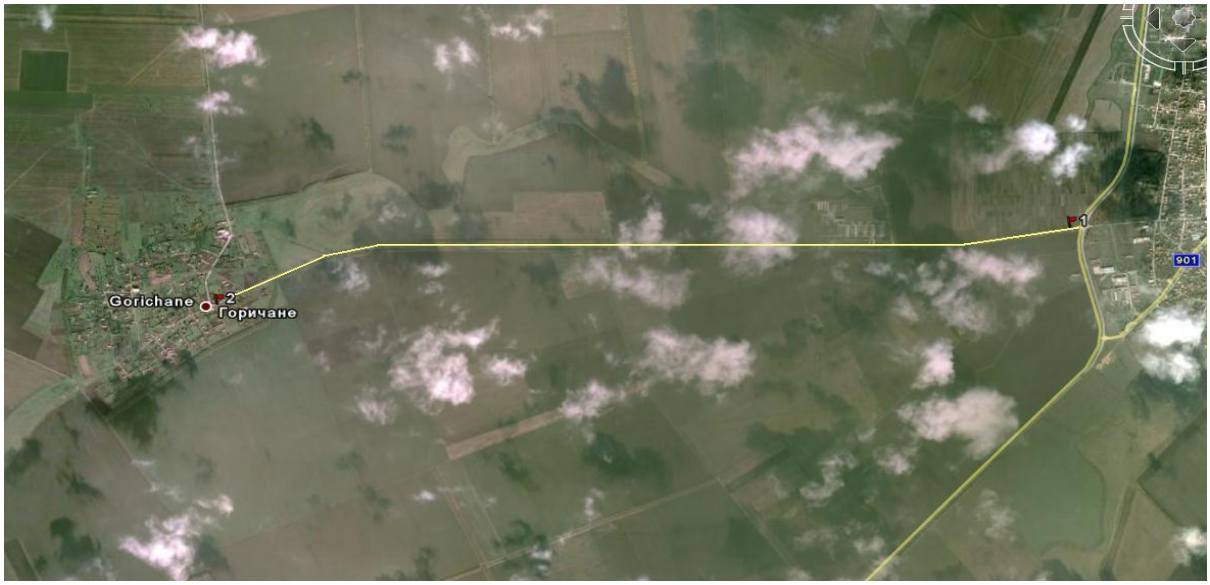
The survey was carried out within one astronomical hour and the data were processed sequentially with the "Emission" and "Diffusion" modules of the program.

In addition, a forecast was made with a 50% increase in traffic during the summer season, which can be considered as the worst case with maximum air pollution load from vehicular traffic (line sources of pollution) in the area.

The road section has a total length of 3.0 km. Within the considered section, 3 locations are discretised: No 1, No 2 and No 3 respectively.

2. Route „Municipal road Shabla- Gorichane”, in the section from the I.9 main road to the village of Gorichane

The surveys were also carried out within one astronomical hour and the data were processed in the same way as the emission and diffusion modules. The path length is 6.0 km. Two sites are discretised within the considered section: No. 1 junction for main road I.9 and No. 2 with. 2.



3. Route "Village road network, town of Shabla - Ravno Pole Str, - Stara Planina Str. - "Municipal landfill for non-hazardous waste"

The counting period is one astronomical hour and the data are processed identically with the emissions and diffusion modules. The path length is 1.0 km. Three sites were sampled within the considered section: No. 1 Main Road I.9 Junction, No. 2 Ravno pole Str., No. 3 Stara planina Str.

CUMULATIVE TRAFFIC

Cumulative traffic is an estimate of total pollutant emissions, including potential emissions from heavy equipment used in the implementation of the investment project.
The calculations to determine the cumulative impact took into account the duration of the construction period and the number of heavy equipment trips along the identified routes. The calculations are based on a total construction period of 2 months, during which 1,490 trips are made in a six-hour working day, or an additional 4 trips per hour in both directions.
The cumulative assessment was carried out for two routes:

- Route 1 „Municipal road Shabla- Gorichane ”, in the section from the main road I.9 to Gorichane – potentially dangerous for the populated area;
- Route 2 „International road I.9 – Ravno pole Str. – Stara planina Str.”– Municipal landfill for non-hazardous waste" - the most congested, uniting the total traffic of heavy vehicles.

1. Route „Municipal road Shabla – Gorichane”, in the section from main road I.9 to Gorichane village

Table 6.3-9– Traffic in the section from Main road I.9 to Gorichane village

Receptors	**Background traffic mg/m³**			**Cumulative traffic mg/m³**		
Signal processing	**NOx**	**VOC**	**CH4**	**NOx**	**VOC**	**CH4**
№ 1	5.3E-4	4.3E-4	8.0E-6	8.5E-4	5.3E-4	1.0E-5
№ 2	6.3E-4	9.7E-4	2.0E-5	6.3E-4	9.7E-4	2.0E-5
№ 3	1.7E-4	2.0E-4	4.1E-6	3.9E-4	2.4E-4	5.4E-5
C max	1.8E-3	2.2E-3	4.0E-5	4.3E-3	2.7E-3	6.0E-5

Table 6.3-10- Traffic in the section from Main road I.9 to Gorichane village

Receptors	**Background traffic mg/m³**	**Cumulative traffic mg/m³**

Signal processing	**CO**	**CO2**	**N2O**	**CO**	**CO2**	**N2O**
№ 1	6.7E-3	0.039	1.1E-6	4.1E-3	0.075	2.4E-6
№ 2	8.2E-3	0.089	2.3E-6	8.2E-3	0.089	2.3E-6
№ 3	1.7E-3	0.018	4.8E-7	1.9E-3	0.035	1.1E-6
C max	1.9E-2	0.20	5.2E-6	2.1E-2	0.38	1.0E-5

Table 6.3-10- Traffic in the section from Main road I.9 to Gorichane village

Receptors	**Background traffic mg/m³**			**Cumulative traffic mg/m³**		
Signal processing	**Cd**	**Pb**	**PAH**	**Cd**	**Pb**	**PAH**
№ 1	1.25E-10	1.20E-7	7.45E-8	2.40E-10	1.20E-7	2.46E-7
№ 2	2.79E-10	2.67E-7	1.66E-7	2.79E-10	2.67E-7	1.66E-7
№ 3	5.82E-11	5.56E-8	3.46E-8	1.11E-10	5.56E-8	1.14E-7
C max	6.30E-10	6.02E-7	3.75E-7	1.29E-9	6.02E-7	1.24E-6

Traffic in the section from Main road I.9 to Gorichane village

Receptors	**Background traffic mg/m³**			**Cumulative traffic mg/m³**		
Signal processing	**PM**	**DIOX**	**PSBs**	**PM**	**DIOX**	**PCBs**
№ 1	1.59E-6	5.41E-14	5.31E-10	7.01E-5	2.30E-13	7.07E-10
№ 2	3.54E-6	1.21E-13	1.18E-9	3.54E-6	1.21E-13	1.18E-9
№ 3	7.38E-7	2.51E-14	2.47E-10	3.05E-5	1.07E-13	3.28E-10
C max	7.99E-9	2.72E-13	2.67E-9	3.40E-4	1.16E-12	3.56E-9

2. Route „International road I.9 – Ravno pole Str. – Stara planina Str.– Municipal landfill for non-hazardous waste”

Table 6.3-12– Traffic - „International road I.9 – Ravno pole Str. – Stara planina Str. – Municipal landfill for non-hazardous waste”

Receptors	Background traffic mg/m³			Cumulative traffic mg/m³		
Signal processing	**NOx**	**VOC**	**CH4**	**NOx**	**VOC**	**CH4**
№ 1	0.00120	0.00162	0.00003	0.00305	0.00322	7.0E-5
№ 2	0.00764	0.01037	0.00021	0.00511	0.00449	1.0E-4
№ 3	0.00039	0.00062	0.00001	0.00066	0.00051	1.0E-5
C max	0.0146	0.0169	0.0004	0.0199	0.0218	4.6E-4

Table 6.3-12- „Traffic - „International road I.9 – Ravno pole Str. – Stara planina Str. – Municipal landfill for non-hazardous waste”

Receptors	Background traffic mg/m³			Cumulative traffic mg/m³		
Signal processing	**CO**	**CO2**	**N2O**	**CO**	**CO2**	**N2O**
№ 1	0.0125	0.137	4.1E-6	0.0259	0.319	9.41E-6
№ 2	0.0805	0.878	3.0E-5	0.0296	0.499	2.01E-5
№ 3	0.0094	0.047	1.3E-6	0.0029	0.061	2.04E-6
C max	0.152	1.67	5.0E-5	0.170	2.10	7.13E-5

Table 6.3-13. - Traffic - „International road I.9 – Ravno pole Str. – Stara planina Str. – Municipal landfill for non-hazardous waste”

Receptors	Background traffic mg/m³			Cumulative traffic mg/m³		
Signal processing	**Cd**	**Pb**	**PAH**	**Cd**	**Pb**	**PAH**
№ 1	4.34E-10	3.83E-7	2.88E-7	1.01E-9	8.51E-7	7.61E-7
№ 2	2.76E-9	2.46E-6	1.82E-6	1.59E-9	9.65E-7	1.47E-6
№ 3	1.50E-10	1.47E-7	8.66E-8	1.97E-10	1.06E-7	1.96E-7
C max	5.25E-9	4.64E-6	3.49E-6	6.67E-9	4.93E-6	5.26E-6

Table 6.3-14- Traffic - „International road I.9 – Ravno pole Str. – Stara planina Str. – Municipal landfill for non-hazardous waste”

Receptors	Background traffic mg/m³			Cumulative traffic mg/m³		
Signal processing	**PM**	**DIOX**	**PSBs**	**PM**	**DIOX**	**PCBs**
№ 1	7.0E-5	2.24E-13	1.75E-9	1.91E-4	2.61E-12	3.81E-9
№ 2	4.1E-4	1.41E-12	1.12E-8	3.91E-4	1.43E-12	5.21E-9
№ 3	2.0E-5	6.13E-14	6.48E-10	5.01E-5	1.99E-13	6.05E-10
C max	8.0E-4	2.72E-12	2.12E-8	1.32E-3	6.19E-12	2.45E-8

This model summarises the possible maximum exposure during the construction phase of the wind farm.

The following table provides a comparative analysis of the calculated maximum individual concentrations of pollutants in the near-surface atmospheric layer at maximum concentration (C max).

Table 6.3-15- Comparative analysis of calculated maximum concentrations of individual pollutants

Pollutant	C max concentration		MAC		
	value	measure	value	measure	type
NOx	19.9	µg/m³	200	µg/m³	average per hour
CO	0.17	mg/m³	10	mg/m³	eight hours
Pb	0.005	µg/m³	0.5	µg/m³	average per year
Dust	1.32	µg/m³	50	µg/m³	average per day

The analysis was carried out on key indicators characteristic of the main groups of pollutants in the exhaust gases.

The results show that even at the maximum expected concentration of pollutants in the ambient air, the values are well below the limit values.

6.1.2. Emissions during the operational phase

There will be no emissions of pollutants into the atmosphere during the operational phase. The main objective of the investment plan is related to the use of renewable energy sources, thus limiting the use of conventional methods and technologies for energy production and generation that emit man-made pollutants into the air - combustion processes, thermal oxidation of fuels, etc.

6.1.2. Assessment of expected changes in air quality during the construction and operational phases

Based on the model calculations and projections of emissions from the site, it can be concluded that the investment project in this part will not have a significant impact on air quality in the area.

The impact of fugitive emission sources is acceptable, even in the worst case scenario, not only locally but also regionally.

The favourable location of the site in relation to urban areas and the dynamic meteorological conditions provide good conditions for the dispersion of pollutants in the atmosphere and limit their retention in the soil layer.

Particulate emissions are expected to be most intense during the construction period, with a local impact range of up to 100 m from the source.

Pollutants generated by associated activities, such as welding fumes, aerosols from painting activities, etc., are usually in insignificant quantities, dissipate quickly and do not have a significant impact on ambient air quality.

The cumulative assessment of the impact of the investment proposal on ambient air can be presented as follows:

During construction and implementation phase

- Type of impact - direct;
- Territorial extent - local/limited;
- Degree of impact - below acceptable limits (MPC);
- Duration - short-term;
- Frequency, likelihood - low;
- Possibility of recovery - yes;
- Cumulative effect - yes (in case of simultaneous construction with other IPs)

The impact on air quality during the construction period is considered to be objectively inherent, local in extent and limited in impact. This assessment is also valid for an alternative location of the wind turbines within the wind farm with no change in the total number of turbines.

During the operational phase

After construction and during operation, the impact on ambient air is considered to be zero. During this period, the impact is even a positive consequence of an indirect reduction in 'greenhouse gas' emissions.

Table 6.3-16– Emissions during the operational phase

Estimated impact					
Component	**Degree of impact**				**Comment**
	High	**Medium**	**Low**	**none expected**	
Climate				√	
Surface water				√	
Groundwater				√	
Land and soil				√	
Subsoil				√	
Landscape				√	
Vegetation				√	
Wildlife				√	
ltural heritage				√	

6.2. Soil

6.2.1 Impacts during construction phase

During the implementation of the Investment Project, the following impacts on soils may occur during the construction period:

Mechanical damage to the integrity of the humus layer on the land as a result of encroachment by construction equipment and excavation for the foundations of the wind turbines and associated infrastructure;
Sealing of a portion of the land area under the wind turbine foundations, service areas and service process roads;.

- Mechanical damage to the integrity of the humus layer when digging trenches for the laying of cables /restrictive conditions in this case are related to the implementation of regulatory requirements - Regulation No. 26/. It is not expected that the humus horizon will be disturbed during the laying of underground conduits /cables and telecommunication cables/, as the laying of the conduits will take place when the soil layer is separated and returned for restoration after the trench is filled. The lines will not prevent the land from being used for agricultural purposes and will not lower its category.
- Tamping and compaction of soils in areas planned for infrastructure communications (linear along the routes of the infrastructure). Compaction is removed by agricultural measures - ploughing, milling;
- Contamination /local and short-term/ with construction waste and materials on the construction site and adjacent areas. Construction materials and waste /depending on their residence time/ may, to some extent, influence the response of the surface soil layers to an increase in alkalinity;

- It is possible that gases from construction activities/from the operation of internal combustion engines (ICE) of road transport equipment, from welding and painting activities could affect the surface layer of the adjacent terrain to some extent. As the impact will be short term and limited in extent, it can be assumed that the self-renewal processes in the soil will restore its properties in a relatively short time.

According to Art. 1 of the Agricultural Land Conservation Act, construction can only take place after the humus layer has been removed from the designated area. Subsequently, the humus will be used for land reclamation in the affected areas outside the area of the plot designated for development, in accordance with the Land Use and Land Management Act and the requirements of Regulation No. 26 on Reclamation of Disturbed Land, Improvement of Poorly Productive Land, Removal and Utilisation of Humus.

The wind turbines will be installed on the parcels of land shown in Table 1. These plots are subdivisions of larger plots with old plot numbers listed in the notification documents. This has been done by the client in order to reduce the area of agricultural land to be rezoned.

The area planned according to the prepared detailed development plans will be permanently affected with a total area of **53.28** decares, of which: inside the own plot - 19.72 decares (foundations 6.30 decares and internal roads 13.42 decares) and outside the own plot - 33.56 decares (cable routes and fencing of existing field roads);

Temporarily, **13.62** decares would be affected, of which 12.11 decares within the own land plots (installation sites) and 1.51 decares outside the own land plots (cable runs within the easement of the existing municipal asphalt road DOB 3223).

Temporary installation sites will be constructed of crushed stone embedded in gravel. Upon completion of the installation works, they will be backfilled with soil to the level of the surrounding ground.

During construction, part of the remaining area of the investor's land will be used for temporary activities, mainly related to the installation of the turbines, which will then be restored. During the operational phase, no crane site will be required for the replacement of units and elements. However, if necessary, the "excavated" crane site can be used by temporarily removing the topsoil above it. It will be reinstated at the end of the works.

For the construction and operational maintenance of the wind turbines, it is planned to construct service roads with permanent surfacing outside the sites with a total length of approximately 8,219 m, of which 6,712 m on existing field roads and 1,507 m on the existing municipal asphalt road DOB 3223. The external road connections will affect 33.56 decares /6.712 km x 5m wide / already used for dirt roads but without pavement (effectively existing dirt roads will be covered with gravel).

The connection to the power grid will be made underground, according to the instructions of the then operating company - EON (now Energo-pro) or NEK EAD, through underground cable lines with a total length of 9,787 km: within the company's own premises - 1,568 km, on field roads - 6,712 km and in the easement of the municipal asphalt road DOB 3223 - 1,507 km. The cables will be laid in 1.30 m deep and 0.60, 0.80 and 1.20 m wide trenches on a sand cushion and will be marked with yellow PVC tape along their entire length. Details of the properties through which the underground cables will pass can be found in the investment project.

The above indicators for the alternative sites are similar in terms of the areas permanently affected by the wind turbine foundations and the areas temporarily affected by the installation sites. Differences of up to 20% are observed in the areas permanently affected by road gradients inside and outside the sites (for the latter, the impact is not significant as existing gravel roads are affected). With regard to the cable network, despite the differences in the length of the cables and the areas temporarily affected, the impact does not change its nature - temporary, short-term (only during the construction period), with the possibility of restoration (the area does not change its use).

At present, no project has been developed for the reclamation of the sites after the eventual closure of the park, but the nature of the activities and the sites envisaged in the investment proposal do not present any obstacles to their implementation, restoring the original productivity of the disturbed land, including the areas of the foundations, when they are crushed and processed as construction waste.

Considering that the total area of arable land in the municipality is approximately 261,058 decares, the area of

changed use for the wind farm - 19.72 decares - represents 0.007% of the arable land (1 wind farm changes on average 1.37 decares of agricultural land). Therefore, the implementation of the project will not affect a significant amount of land. Even taking into account the cumulative effect of other investment proposals in the area, the area of agricultural land converted in the worst case scenario would not exceed 1% of arable land (a more realistic estimate based on the data for wind turbines built and under construction by 2022 - 339 pcs x 1.37 decares/unit) = 464 decares = 0.17%, represents a change of use of about 0.5% of arable land, also taking into account investment intentions after 2010).

The total area of the 16 districts of Shabla municipality is 329 639 ha, which is 5.6% of the area of the Black Sea coast and 7.0% of the area of Dobrich district. The total area of agricultural land is 284 433 ha (80% of the total area of the municipality, which is much higher than the national average of 58.7%).

The cultivated area is 261 058 ha, which is 91.8% of the agricultural area and 79.2% of the area of the whole municipality, which is one of the highest indicators in the country. The largest part is occupied by arable land, while permanent crops and grassland have an insignificant share. The cultivated area of the forest fund is less than 100 ha, and the field protection belts occupy 2.05% of the municipality's territory.

The irrigated area is 21,315 ha, which is only 6.5% of the arable land, and most of the irrigation facilities have been destroyed and only part of these areas are suitable for irrigation.

Forests, including the area of the State Forest Fund, including the field protection forest belts, occupy 11,099 ha, which is 3.3% of the municipality territory, compared to the national average of 33.6%.

Populated areas occupy 20 304 ha, or 6.2% of the municipality's territory, compared to the national average of 5%.

Uncultivated land accounts for 23,375 decares, or 7.1% of the municipality territory, with meadows and pastures accounting for 68.6% of uncultivated agricultural land, water areas for 7,516 decares, or 2.3%, and quarries, industrial sites, etc. for 6,287 decares, or 1.9%.

Areas for mineral extraction, mineral resources and landfills are insignificant (0.3%) and will decrease in the future. There is one aggregate quarry in the municipality.

Areas dedicated to transport and infrastructure account for less than 0.7% of the municipality's total area, which is close to the national average (0.6%) but insufficient given that 75% of the municipality's area is covered by the E-87 (I-9) international road.

Protected areas and natural monuments cover 8,600 decares, or 2.6%, and sanitary protection zones cover 0.07% of the municipality's territory. Protected areas are intended to protect the biodiversity of ecosystems and the natural processes that take place within them, as well as characteristic or remarkable non-living natural sites and landscapes. Natura 2000 sites are not included in this area.

6.2.2 Impacts during the operational phase

The implementation of the investment proposal is associated with the following potential impacts during the operational phase:

- Wind energy activities are not expected to have a negative impact on adjacent land;
- Accidental spills of hazardous substances from improper oil changes on wind turbines are possible, but the contamination is unlikely to contaminate soils (if appropriate measures are taken, the likelihood of this impact is minimised);
- Soils in the development area will lose their soil functions. The law provides for a procedure to exclude land (fields) from the agricultural fund. The project provides for the separation of humus and part of the lower soil horizons in accordance with the requirements of Regulation No. 26 and the use of the land mass for reclamation.

Based on the above analysis, it can be predicted that the project's impact on the soil will be mainly during the construction phase and zero during the operation phase, with a limited spatial extent, permanent for the areas with construction (generator foundations) and temporary for the rest of the area,

with the possibility of restoration (reversibility of impacts). This assessment is also valid for the potential alternative sites, provided that the total number of wind turbines is not changed.

Cumulative effect

The implementation of the investment proposal, together with other similar investment proposals in the municipality of Shabla, may have an insignificant negative cumulative impact on the soil. At this stage, taking into account the small capacity of the wind farm and the amount of arable land, as well as the possibilities to further minimise the affected area (by digging the foundations and backfilling them with topsoil), it can be said that the cumulative effect is negligible.

6.3. Geological environment

The impacts of the proposed investment on the geological subsurface could be significant and long-lasting. They are related to the mechanical interaction of the wind turbine foundations with the ground. The seismicity of the area is also an important risk factor.

The implementation of the investment proposal may have the following impacts on the geological subsoil:

- permanent static loads from the wind turbine foundations;
- temporary static and dynamic loads during construction;
- some increase in infiltration during the construction period due to the temporary removal of vegetation cover and the creation of waterless forms at the construction trenches of the wind turbine foundations;
- Changes in the geological structure as a result of excavation and planning works (changes are long-lasting, with a small territorial extent; in terms of significance - insignificant for the geological environment)

The location of the site excludes the occurrence of adverse physical and geological processes and phenomena and is not associated with increased geological risk other than seismicity. The main adverse processes and phenomena, such as landslides, collapses, abrasion, technogenic loading, etc., are not present in the areas under consideration.

The site is located in a flat area, far from ravines, dry valleys, rivers, lakes and the sea.

These impacts, due to the location of the site and the nature of the ground base, may not cause the activation of landslides, erosion and other adverse physical and geological processes, but may cause subsidence and scarping of the facility and exceed the bearing capacity of the ground base.

Recommendation:

At the detailed design stage, the seismic forces and the dynamic component of the wind load, as well as the possible settlement characteristics of the earth foundation, should be taken into account when determining the loads.

Conclusion:

There is no risk of loss of stability of the facilities and the surrounding ground, provided that the foundation and design standards and the quality of the construction and installation works (CAW) are complied with. The impact on the geological environment is considered to be:

- **insignificant in an area of small territorial extent;**
- **long-term (continuous) - at least 20 years;**
- **constant;**
- **without cumulative effects from other wind turbines or installations;**
- **reversible - dismantling of wind turbines, recycling of their foundations and land reclamation.**

On this basis, it can be predicted that the implementation of the investment proposal will not be associated with significant risks to the geological environment and will not provoke adverse landslides, erosion and other adverse physical and geological processes, provided that the foundations of the supporting pillars are properly designed.

Cumulative effect

The nature of the investment proposal does not determine the existence of a cumulative effect with other (including analogous) investment proposals, as it does not actually affect the subsoil.

6.4. Waste

At present, no waste as defined by the Waste Management Act is generated in the area. It will be generated during the construction, operation and decommissioning of the wind farm.

During **the construction phase**, the main waste generated will be excavated material:

- Excavations for foundations - approx. 11,470 m3, of which approx. 9,170 m3 will be used for backfilling and vertical layout (approx. 2,300 m3 - loose soils unsuitable for backfilling, remaining to be removed);
- Excavations for crane (assembly) sites - approximately 4,240 m3, which will be used for backfilling to form spoil heaps and for vertical design;
- Excavation for trenches 0.6 m wide and 1.3 m deep for the underground installation of the wind farm's electrical cables - approximately 7,630 m3, which will be used for backfilling;
- Excavation of roads (to create new gravel surfacing in the area of existing farm roads) - approximately 3,300 m3 - all of which will be used to backfill spoil heaps;

The total amount of excavated spoil is approximately 26,640 m3. This includes the excavated humus mass. Part of the excavated spoil will be used for backfilling and vertical development of plots and roads (approx. 24 340 m3), and the remaining 2 300 m3 will be transported to a regulated landfill or used to backfill the landfill - it is planned to use the excess excavated spoil to make the top containment screen of the landfills to be closed. For example, under the EUROPEAID/D/1107408/D/SV/BG project "Development of solid municipal waste management measures for the regions of Burgas, Dobrich, Provadia", the municipal landfills of the municipalities of Shabla, Kavarna, General Toshevo and Balchik will be closed.

The humus layer will be stored in accordance with legal requirements (Regulation No. 26/1996 on the reclamation of disturbed land, improvement of poorly productive land, removal and use of the humus layer /DV 89/1996, 30/2002/).

During the entire construction and installation period, certain quantities of waste will be separated, which we have conditionally divided and indicated according to the activities and the period of generation, namely:

Table 6.4-1. Waste generated during the construction phase

№	code	Name	Estimated quantity	
			m^3	kg
CONSTRUCTION WASTE - construction phase				
1	12 01 13	welding waste	0.030	150
2	17 01 01	Concrete	5.000	9000
3	17 02 01	Wood	5.000	3500
4	17 04 01	copper, bronze, brass	0.010	250
5	17 04 02	aluminium	0.200	350
6	17 04 05	cast iron and steel	0.250	2000
7	17 04 07	Mixtures of metals		500
8	17 04 11	Cables other than those mentioned in 17 04 10	0.500	400
9	17 05 04	Soil and stones other than those mentioned in 17 05 03	2 300	3680
10	17 09 04	Mixed construction and demolition waste other than those mentioned in 17 09 01, 17 09 02 and 17 09 03	0.500	3000
11	20 02 01	biodegradable waste	10.000	1500
ASSEMBLY WASTE - installation work on wind turbines				

1	12 01 13	welding waste	0.010	50
2	15 01 01	paper and cardboard packaging	0.010	30
3	15 01 03	packaging of wood materials	8.000	5000
4	15 01 04	metal packaging	0.001	40
5	15.01.06	mixed packaging	3.000	450
6	15 01 10*	packaging containing residues of dangerous substances or contaminated with dangerous substances	0.010	45
7	15 02 02*	absorbents, filter materials (including oil filters not elsewhere specified), wiping cloths, protective clothing contaminated with dangerous substances	0.050	120
8	16 01 17	ferrous metals	0.010	80
9	16 01 18	non-ferrous metals	0.010	50
10	17 02 03	Plastic	0.070	200
11	17 04 11	Cables other than those mentioned in 17 04 10	0.120	100
12	20 01 40	Metals	0.020	120
HOUSEHOLD WASTE				
1	20 03 01	Mixed household waste from construction personnel	8.0	5 000

Recyclable waste - wood, metal, plastic and paper packaging - is collected separately and handed over to the collection points of companies operating in the Municipality and holding a certificate under the Waste Management Act.

Hazardous chemical substances and mixtures during construction

During the construction period, only fuels, lubricants related to the operation of construction machinery and heavy transport vehicles, and a limited amount of paints and varnishes will be used. They will not be stored on the construction sites.

Nomenclature of hazardous chemicals and mixtures used:

- Diesel;
- Petroleum lubricating oils;
- Petroleum engine, gear, hydraulic and machine oils;
- Miscellaneous paints and varnishes (paints, varnishes, hardeners, solvents).

Due to the limited scope of construction activities, it is not expected that fuels and lubricants will be stored on site. Machinery will be serviced during construction at specialist service stations and petrol stations.

Limited amounts of miscellaneous generator maintenance waste will be generated during operation. These will be collected at the time of generation by the contracted maintenance and repair companies (usually companies under the umbrella of the generator manufacturers), transported to their own temporary storage facilities and delivered to companies authorised under the Waste Management Act for further treatment.

The non-productive nature of the site (in the general sense of the term) does not imply the generation of production waste. The investment proposal is at a conceptual stage (pre-investment studies), therefore the estimate of waste generated is very preliminary. The policy is to recycle metal and electronic components as much as possible.

During the operational phase, waste will only arise from the maintenance of the facilities by specialised service organisations. Typically, these are warranty and post-warranty service organisations of the generator manufacturers and they are responsible for the waste generated in this activity. This has been established on the basis of many years of experience in the maintenance of existing installations.

Table 6.4-2 Waste generated during the operational phase

№	CODE	NAME	Estimated quantity	
			m^3	kg
1	20.01.33*	batteries and accumulators included in 16 06 01, 16 06 02 or 16 06 03 and unsorted batteries and accumulators containing such batteries	0.030	100
2	13.02.05*	non-chlorinated mineral-based motor, lubricating and gear oils	0,550	500
3	15.02.02*	absorbents, filter materials (including oil filters not elsewhere specified), wiping cloths and protective clothing contaminated with dangerous substances	0,200	80
4	20.01.39	Plastics	0.000	10
5	17.04.11	cables other than those mentioned in 17 04 10	0,001	30
6	16.02.13*	discarded equipment containing hazardous components ([3]) other than those mentioned in codes 16 02 09 to 16 02 12	0.002	50
7	17.05.05*	dredged spoil containing hazardous substances	0.001	200
8	20.01.21*	fluorescent tubes and other waste containing mercury	0,020	10
9	16.06.01*	lead-acid rechargeable batteries	0,003	50
10	17.04.05	iron and steel	0.004	200
11	15.01.01	paper and cardboard packaging	0.002	30
12	15.01.02	plastic packaging	0.002	40
13	13.01.10*	non-chlorinated mineral-based hydraulic oils	0.020	180
14	13.02.07*	rapidly biodegradable motor, lubricant and gear oils	0.010	90
15	15.01.07	glass packaging	0.001	30
16	15.01.03	packaging of wood materials	0.002	50
17	13.08.02*	other emulsions	0.001	10
18	16.01.14*	antifreeze fluids containing hazardous substances	0.001	10
19	08.04.09*	waste adhesives and sealants containing organic solvents or other hazardous substances	0.0001	1
20	08.01.11*	waste paints and varnishes containing organic solvents or other hazardous substances	0.001	12
21	16.02.14	end-of-life equipment other than those mentioned in codes 16 02 09 to 16 02 13	0.020	80
22	16.05.04*	gases in pressure vessels (including halons) containing dangerous substances	0.0001	1
23	20.01.35*	discarded electrical and electronic equipment other than those mentioned in 20 01 21 and 20 01 23 containing hazardous components	0.010	40
24	17.05.03*	soil and stones containing hazardous substances	0.001	250
25	16.01.17	ferrous metals	0,080	100
26	16.01.18	non-ferrous metals	0,030	40
27	15.01.10*	packaging containing residues of dangerous substances or contaminated with dangerous substances	0,050	30

Notes*:*

1. Estimated data are calculated on the basis of statistical material from many years of practical operation of wind turbines by the manufacturer's authorised service.

2. As the generators are operated and their lifetime/resource decreases, the estimated annual emissions will change (increase) due to depreciation and wear of the equipment and more frequent repair and maintenance activities.

Waste impacts can be classified as:

- insignificant, with limited territorial scope and quantity;
- short-term during the construction phase, with more significant impacts
- long term over the lifetime of the project, with negligible impacts;
- with minimal cumulative effect from other wind turbines or facilities;
- reversible - if the wind turbines and their foundations are recycled after dismantling.

6.5. Landscape

Assessment of the areal characteristics of the affected landscape

As stated in Section 1.4.1, the minimum area required for the efficient operation of a wind turbine, which can also be treated as a type of energy efficiency easement, is on average up to 208 decares in this case.

Assuming a 3km zone of influence around the wind farm (Map 5), bounded by a polygonal line through the centres of the terminal wind turbines, the spatial extent of the impact would cover an area of 107,503.785 decares. The area of the Prolez WPP polygon is 7434.841 decares, and with the "efficiency" addition along its perimeter (P=12062 m, B=5D) - 13043.671 decares. Assuming maximum wind turbine parameters, a maximum of 62 wind turbines can be placed on this area without "taking" wind. In the present case, a total of 31 wind turbines (2 times less) are deployed together with other advancing wind turbines.

The area occupied by a wind turbine as a projection of the rotor on the ground surface is up to 20.86 decares and the occupied space (calculated as a cylinder) is up to 1,029,125 m3.

As a transverse barrier, the occupied area is up to 151.5x163=24564 m2, of which the danger area (of the blade rotation) is 20 860 m2, i.e. about 48%.

These characteristics characterise the so-called "danger zone". The density of this zone is - 1.83% (of the wind turbines of the considered IP only) and 2.83% (together with the other wind turbines proceeding within the polygon).

The cumulative impact of all the wind turbines (140) on the entire area of influence (with a total area of 107,503.785 ha) is:

- The maximum number of wind turbines that can be used in the area in terms of their efficient

operation - 518 (3.7 times more than all the wind turbines applied for, which is 27% of the maximum number);

- Density of the danger zone - 0.88% (all wind turbines included).

It can therefore be concluded that the spatial and volumetric impact of the WPP under consideration, together with the other IPs in the area, is quantitatively small.

Figure 6.5-1. Landscape with wind turbines built in the area

Visual impact

According to foreign experts, attempts to integrate wind farms into the landscape are in vain. It is neither possible nor desirable to go down the route of landscape protection in the classical sense. On the contrary, successful landscape planning must be sought. The siting of wind turbines must be integrated into the process of landscape planning, not landscape protection. The question is not "How can wind turbines be sited so that they are not visible?", but "How can wind turbines be sited so that they form a beautiful landscape? Creating a new landscape or restoring a landscape through the use of turbines implies that the client is undertaking a landscape design project. This is not appropriate in this case because there are only three wind turbines.
Basically, wind turbines can't hide - they are visible anyway in the landscape that becomes a wind turbine landscape.

The integration of the investment proposal into the landscape refers to the overall design and siting of the wind turbines, not to each individual wind turbine. It is limited to the choice of the number, arrangement and height of the wind turbines in relation to the landscape. In this case, the turbines are of one type and can be conventionally referred to as a wind farm in order to look at different siting options in terms of mitigating the impact on the landscape.

Conclusion

The measures provided for in the investment proposal do not involve any changes to the topography or the construction of facilities that would impede the natural flow of water. The proposed installation of the wind turbines will have no impact on the landscape features of the coastal cliffs and steppe vegetation.

The project under consideration foresees some visible changes in the landscape due to the installation of 7 wind turbines.

The wind turbines envisaged in the project, together with neighbouring wind turbines, can in principle change:

- spatial structures - visual spaces
- - landscape types;
- - the visual impact of local and general scale (towers, blades).

Construction phase

During the construction phase, possible changes in conditions affecting the formation of landscape elements in the contact natural and agricultural areas are relatively minor. They are related to the construction machinery involved in the excavation and the concrete work on the foundations of the towers, which will temporarily affect both the views and some of the landscape elements: air, flora and fauna in the adjacent areas.

Operational phase

No changes in conditions affecting the formation of landscape elements in the contact natural areas are expected during operation.

The subsequent impact is related to the operation of the wind farm. The new landscape elements will be 7 vertical sites (towers), arranged in a block pattern and well separated from each other. This phase will result in a permanent visual change to the landscape and the introduction of new landscape dominants. In principle, wind turbines cannot be hidden - they will always be visible in the landscape, which will become a landscape of wind turbines. They will stand out as independent vertical structures from the surrounding landscape, which is dominated by low horizontal structures - fields, vegetation belts, shallow valleys. The changes in the structure of the landscapes are related to the introduction of a new ground pattern of man-made structures, without reproducing the urban environment.

The impact is manifested in a change in the viewpoint along a length of about 6 km.

The investment idea does not foresee the construction of sources emitting harmful substances into the atmosphere, water and agricultural land, therefore, according to the expert assessment, the measures will not at all affect the possibilities of self-cleaning and self-restoration of the typical and subtypical landscapes contacting the site.

The impact on the surrounding landscape is immediate, visual and long-lasting.

The landscape forming elements in the areas subject to the investment proposal will be slightly changed - only the land use at the base of the tower will be changed and new local landscape structures will be created (energy construction).

The investment idea does not provide for the construction of sources emitting harmful substances into the atmosphere, water and coastal areas, therefore, according to the expert assessment, the measures will not at all affect the possibilities of self-cleaning and self-healing of typical and subtypical landscapes contacting the site.

The impact during the construction period is related to the opportunities for full self-healing of the contact zones.

In conclusion, it can be said that the character of the site and its volumetric and spatial parameters fit seamlessly into the overall landscape and cannot independently cause significant changes to its elements and types. Valuable views of protected and naturally sensitive landscapes will not be obstructed, nor will views in areas of tourist use be altered.
In conjunction with other similar investment proposals, there may be some more significant local impacts on views in an area without valued landscapes and characteristic views, and away from the main road network, the coast and areas used for tourism and recreation.

Flora and fauna and natural sites (impact of emissions on protected areas - "Kaliakra" with code BG0002051, "Shabla Lake Complex" with code BG0000156, Kaliakra Complex with code BG0000573 and Bilo with code BG0002115).

6.6.1. Impact on vegetation

There are no developed steppe communities, wetlands or protected flora in or near the wind farm. No priority habitat types for nature conservation will be destroyed.

Impact on vegetation and plant communities listed in Annex II of Directive 92/43/EEC

The land proposed for the implementation of the investment proposal is free of tree and natural grass vegetation. The sites do not contain any plant species protected under Article 40 of the Biodiversity Act.

The construction of the wind farm will not require the removal of any permanent woody vegetation. Following the construction activities and reclamation of the underground infrastructure routes, spoil and aggregate disposal sites, the land will be planted with agricultural crops.

Impacts are temporary, localised and insignificant. No species of conservation concern will be affected.

Due to the aggressiveness and persistence of ruderal grasses, overgrowth and self-settling can be expected following construction.

At the end of the construction period and after the temporary areas have been reclaimed, the land will be replanted with agricultural crops.

Impacts on plant life are insignificant, short term and limited in extent. Areas affected by construction will fully recover their intended use and biotope activity.

6.6.2. Impact on wildlife

Direct impact on birds

The conclusions of the field studies on bird migration are as follows:

1. In the area of Gorichane area during the migration period.
2. The migration of soaring waterbirds (storks, pelicans, cranes) is not intensive in the study area.
3. The site does not meet the requirements for a "narrow front" of migration.
4. There are two main migration corridors during the autumn migration - north-east-south-west and north-south.
5. In spring, the birds pass through the area mainly in northerly winds in the main direction of north and north-east.
6. Migration is most intense in light and moderate winds.
7. Most birds of prey pass at altitudes below 50 m and half of the waterbirds recorded pass through the 50 to 200 m altitude belt.
8. No globally threatened bird species nest or occur in the study area.

Habitat destruction

The implementation of the project is associated with the destruction of a small amount of land - 19.72 decares of fields, therefore it will not have a significant impact on the species that use this type of habitat for nesting - ~25

species have been identified that nest in vegetation belts, sinor and agricultural land, with the majority of birds nesting in or near the belts. In agricultural areas, nesting species are widely distributed throughout the region. Direct impacts are only possible on ground-nesting birds in agricultural areas. These are mainly Eurasian skylark (*Alauda arvensis*), yellow wagtail (*Motacilla flava*) and common quail (*Coturnix coturnix*). These species are not subject to protection in the protected areas. Increased anthropogenic pressure and pollution from domestic and construction waste is expected during construction, which will affect areas occupied by the species - temporary loss of habitat and disturbance of species /mainly Eurasian skylark /*Alauda arvensis* /and yellow wagtail /*Motacilla flava*/. No direct negative impacts such as habitat loss, mortality of individuals and displacement are expected for the Calandra lark (*Melanocorhypha calandra*), subject to compliance with the prescribed mitigation measures. All habitats on the site are home to breeding species with national and European conservation status, and therefore they and their habitats are subject to protection and special conservation measures. The site is one of the areas with the highest concentration of Garden Warbler and Thick-billed Lark in Bulgaria.

The region is characterised by large agricultural areas with mosaic-like scattered belts totalling over 1500 ha. They clearly exceed the needs of the species for such areas (taking into account their density).

For all bird, mammal, amphibian and reptile species protected in the protected areas, no habitat loss or degradation is expected, as well as no impact on the number and density of their populations, as the area of the investment project is not a natural habitat and is outside the Natura 2000 network areas.

The implementation of ancillary infrastructure - the construction of macadam roads on existing dirt roads and the construction of an underground power supply - may affect the habitat to a very limited extent and only temporarily. The latter has no impact on the habitat during its operation.

Impact on feeding and wintering areas

The proximity of Shabla Lake determines the presence of birds, mainly geese, in the area during all winter months. Most birds are recorded in January.

Throughout the period, geese, buzzards and field harriers can be found in the region on their foraging and roosting flights. The largest flocks of geese pass to the east and south of the proposed park area.

Two globally threatened species, the Red-breasted Goose and the Saker Falcon, have been observed in the study area, with the former expected to be abundant outside the proposed wind farm by 2018. Over 95% of all feeding and passage birds were found east of Gorichane, with no conflict with the proposed facilities. The second species was not recorded in the proposed wind farm area.

Most birds (78%) pass at an altitude of between 50 and 200 m

Goose feeding sites were identified - three frequent and four occasional. Two of the preferred sites, including those with the most birds observed, are outside the wind farm boundaries. Feeding sites depend on the crop of the year and are not constant (changing with crop rotation).

The number of dead birds per day per wind turbine (bird/day/WT) was used as a measure of mortality caused by wind farms. Although the numbers are small, which causes some inconvenience in handling and interpreting their biological significance, they can easily be converted to larger units if necessary, e.g. number of dead birds per year per wind turbine.

Wind Density - this is a characteristic of the wind farm with a unit of decares per wind turbine (ha/WT). We consider this to be more appropriate than the reciprocal (WT/ha) as it gives an idea of the average open area around the wind turbines in a given WPP. The area of the WPP is defined as the area whose boundaries are separated from the outermost wind turbines by a distance equal to their diameter.

Tower height - a number of authors have suggested that mortality is dependent on the height of the WT tower. This dependence should be species (or group) specific, depending on the prevailing flight height in different species (groups). Tower height is given in metres (m).

Turbine diameter - another WT characteristic that may be of biological relevance. The diameter determines the area around the turbine that could be reached by the rotating blades (the so-called "danger zone"). The diameter is given in metres (m).

Average blade tip speed - logically, the faster the blades of the WT rotate, the greater the chance of birds colliding with them. Typically, the speed at which the WT rotates is given in revolutions per minute (rpm). However, from a bird's point of view, the speed of the fastest rotating part of the blade - the tip - is much more important. Therefore, knowing the diameter of the turbine, the angular velocity (rpm) is converted to linear velocity (m/s).

PREDICTION of a probable collision

Birds of prey - Antilogarithmic calculation shows that, at an average speed of 60 m/s, each WT will cause the death of approximately 0.0001924 birds of prey per day. Over the year, this works out at about 0.070226 birds per WT, or 1.4 birds per year for the proposed generators. As 4 of the turbines have a distance of more than 600 - 700 m to neighbouring wind turbines, and in practice the probability of a collision decreases with increasing distance, the estimated probability is ~1.2 birds per year. At the same time, the field surveys showed that almost half of the birds of prey were flying in the lowest altitude band and were at risk of collision. The estimated probability is ~1.6 birds per year.

Wintering waterfowl / Red-breasted goose, Greater white-fronted goose.

Galliformes - Using calculations similar to those for birds of prey, it can be concluded that each WT causes the death of approximately 0.00004023 birds per day. This equates to approximately 0.01468395 birds per WT per year, or 0.29 per year for all wind turbines, and taking into account the additional reduction in probability due to the distance of 4 of the turbines from each other, the estimated probability is 0.25 birds per year.

Songbirds - Each WT will cause the death of approximately 0.00000054 songbirds per day. This equates to approximately 0.0001971 birds per WT per year, or 0.0039 per year for the entire WPP, not taking into account the additional reduction in probability due to the distance of the wind turbines from each other.

The risk of collision between geese, particularly Red-breasted and Lesser White-fronted Geese, and wind turbines has been extensively studied worldwide, with specific direct observations at the St Nicholas WPP sites for 7 years. The precautionary avoidance rate for geese recommended by Scottish Natural Heritage (SNH) is 99%, based on the Fernley et al (2006) study. This will be used in the risk calculations below, but Fernley et al (2006) **recommend a goose avoidance rate of 99.6% for wind turbines**.

AES's seven-year study/monitoring of the St Nicholas WPP shows a 100% avoidance rate for geese. There have been no collisions with geese flying through the park during the monitoring period. An average of approximately 290,000 goose flights were recorded through the park during the winter season. Below we present monitoring data from St. Nicholas - the number of birds passing through the wind farm in different years. In addition, approximately 90% of the birds passing through flew at the risk altitude - up to 300m.

European ground squirrel (Spermophilus citellus). It is characterised by a progressive decline in numbers. The species does not invade arable land. No impact on the species and its population is expected.

Steppe polecat (Mustela eversmannii) is one of the rarest Bulgarian mammals. It lives in open areas and feeds mainly on rodents - salamanders, hamsters, less often on lizards, snakes, birds. There is no likelihood of disturbing the habitats of the species.

Greek tortoise (Testudo graeca) Greek tortoise habitats are found in places where natural grasslands, scrub communities of drakes, hornbeams, dogwoods and spruces have developed. These are characterised by a richer food base and a lack of movement by people and machinery, which is why the species clings to them. As the area where the wind farm will be built is cultivated, there is no likelihood of disturbance to the species' habitat. No fragmentation of the tortoise population in the area is expected. There would be no visual, noise, vibration or electromagnetic impacts on the tortoises of conservation concern in the area during the construction and operation of the wind farm.

Hermann's tortoise (Testudo hermanni) It is widespread throughout the country in areas up to 1400 m above sea level, with the exception of Dobrudzha, mountainous areas in western Bulgaria and lowland areas with

intensive agriculture. The Hermann's tortoise prefers sparse forests, unlike the Greek tortoise, which is typical of grassy landscapes. No negative impacts on the species and its population are expected in the area.

Four-lined snake (Elaphe quatuorlineata). This species is restricted to the Struma River up to about 600 m above sea level. It prefers dry and rocky terrain. It is active during the day and spends most of its time in trees. Its main food is birds and their eggs. It also feeds on rodents, hatchlings of lagomorphs and even small turtles. The Dobrudzha region is home to the blotched snake (Elaphe sauromates), which used to be a subspecies (Elaphe quatuorlineata sauromates) of the four-lined snake (Elaphe quatuorlineata quatuorlineata). The blotched snake inhabits open areas with steppe vegetation, sparse deciduous forests and scrub. The investment proposal area is not a habitat of the species. The habitat of the species is not likely to be disturbed.

Southern crested newt (Triturus karelinii). Occurs in swamps, lakes and slow-moving rivers, which it leaves periodically in summer. Winters mostly on land. The habitat of this species is unlikely to be disturbed..

Analysis of cumulative effects on birds.

A key indicator in the cumulative effect and risk assessment is the quantification of birds. Ornithological surveys in the area have shown that migratory soaring birds and birds of prey are present in low numbers. The results of the surveys are presented in separate reports on the status of the avifauna and bat fauna in separate seasons from 2004 to 2016.

Avifauna monitoring studies on the territory of the WPP Prolez wind farm in the municipality of Shabla (in Appendix 15 of the CD):

- Migratory birds: autumn migration seasons of 2004, 2009, 2019 and 2022, spring migration seasons of 2005, 2010, 2011, 2020 and 2022.

- Breeding birds: the breeding periods of 2010, 2019-2020 and 2022.

- Wintering birds: winter 2010-2011, 2013-2014, 2014-2015 and 2015-2016, 2019-2020 and 2021-2022.

Additional sources of information relevant to the investment proposal area were also used:

1. Results of the project "Mapping and Determination of the Conservation Status of Natural Habitats and Species - Phase I".

2. Report on wintering waterbirds in Bulgaria in the winter of 2011 - 2012, prepared by Econnect.

3. Report "Characteristics of migration of 42 species of Bulgarian avifauna according to the level of current knowledge" (Mateeva, Yankov, 2013). In this report the data from "Migration of soaring birds through the land of the villages Gorichane and Prolez, municipality of Shabla, in connection with an investment plan for the construction of a wind farm by WPP Prolez EOOD /VARNA GREEN ENERGY OOD/.

4. Map of areas at risk for birds from wind turbines - Report prepared by Econnect, 2013.

5. Report "Assessment of map and GIS model with the risk areas for birds in the construction of wind turbines", prepared by PEB consortium, 2013.

6. Results of the study "Assessment of the impact of wintering geese on cereal yields" described in Sector Report II, prepared by Sergey Dereliev and in Dereliev et al, 2000,

7. Study on the migration of soaring birds in the area of Burgas Bay (Michev et al, 2011,

8. Publication on the migration of soaring birds over Bulgaria (Michev et al, 2012)..

Some of the documents used are for information and comparison (nos. 4, 5, 6 in the list above), as they are completed studies with a different main purpose or cover areas around the lakes, while others can be built upon with the results of the field studies (nos. 1, 2, 3, 7 and 8).

From the information and quantitative data collected during the spring and autumn migrations, it can be concluded that the area does not represent a place with a "narrow front" of migration.

The conclusions of these surveys are that no significant concentrations of migratory birds were found over the study area. No patterns of use of the area as a special or important site for migratory birds during seasonal migrations were identified. Spring migration through the area is virtually unnoticed, and the abundance of the species observed here is well below that typical for the country. Autumn migration is higher than spring

migration. Soaring birds are the most dependent on wind conditions and are particularly important in assessing the potential impacts of the investment project. A correlation has been found between the number of birds recorded and the wind direction.
According to the zoning of Bulgaria according to the risk of wind turbine construction (Map of areas with risk for birds from wind turbine construction), the area of Shabla falls into an area with high risk for birds from wind turbine construction.

According to the report "Map and GIS model assessment with bird risk areas for wind turbine construction" prepared by the PEB consortium, 2013, the conclusion for the application of the map is that "the risk map should be used for indicative purposes only, with mandatory one-year monitoring, EIA and Compatibility Assessment Report in high risk areas". This condition has been met by the client of the investment proposal.
The main conclusion of the field surveys and the main limiting factor for the risk assessment is the number of migratory birds, which is low in the area of the proposed wind farm and the site does not have a "narrow front" of migration.

A detailed analysis of the avifauna is provided in Section 5.1 of the Compatibility Assessment Report
The cumulative effect relates mainly to two aspects that directly affect the migration period as a spatial constraint and as a disturbance to birds feeding and resting in their natural habitats. In assessing the cumulative effect, birds can be divided into three main groups according to their presence in the area: migratory, wintering and breeding, where breeding birds may be resident or migratory.

Cumulative effects - areas taken, hunting areas

- On a broad regional scale

On the territory of the populated areas described above (Figure 2.5), the municipalities of Dobrichka, General Toshevo, Krushari, Tervel, Kavarna, Shabla, Balchik, 2,928 wind energy installations are in progress so far, most of them not yet built. In the Dobrich region, a total of 1,285 wind turbines have been implemented, of which 351 are under construction and 934 are in the process or have an EIA decision in force.

Площта на която се разполагат тези 2928 ветроенергийни съоръжения е около 4743 кв. км. На един
The area covered by these 2928 wind turbines is approximately 4743 square kilometres. There is about 1.6 square kilometres per wind turbine. Such a density of turbines is not fatal for migratory birds. The distances between the generators are also sufficient for the free movement of local birds of prey that hunt in the area. The rotor area of a 163 m diameter turbine is 20.87 decares and the rotor volume with a blade thickness of 4.3 m at the base is 89,729 cubic metres. The implementation of all 2,928 generators with 163 m rotors (although not all announced IPs have such a large rotor diameter) would occupy 0.0022% of the airspace of Dobrich district, up to an altitude of 2500 m.

This percentage shows the high value of the airspace used by birds over the territory of the Dobrich region during the implementation and operation of all 2,928 wind turbines, including the current IP. For songbirds, the distances are quite sufficient for their normal existence. For some species of soaring birds, mitigation measures are required as described in Section 6 of the Compatibility Assessment Report.
The actual lost field area for hunting/feeding birds on agricultural land for 2,928 facilities will be approximately 22286 ha, given the average permanent affected area of 7.61 ha per wind turbine /including local access roads with gravel surfacing/, which represents 0.6% of the agricultural land of the Dobrich district /3,851,868 ha/. The impact is considered to be insignificant.

- In Shabla municipality

There are 44 wind turbines in operation and 308 under construction in the municipality of Shabla. There are 123 wind turbines under EIA procedure or with an EIA decision in force but not yet built.
The total area of the municipality is 329.64 square kilometres. Correspondingly, there is 7.5 km2 per commissioned generator, and with the construction of all feasible and implemented IPs, there will be an area of approximately 2.0 km2 per generator.

If all the investment proposals are implemented, which is unlikely, the area per generator will be about 1.1 km2. In the implementation of the evaluated IP, the rotor diameter is up to 163 m or the rotor volume is 89 729 cubic metres. If built with the same rotor diameter - although the minority of the announced IPs have such a large rotor diameter, and the largest rotor diameter of the wind turbines already built does not exceed 93 m - all 308 installations would occupy 0.003% of the airspace over the municipality of Shabla. The figures show that there is plenty of airspace available.

The lost area for hunting /feeding birds on agricultural land for 308 facilities will be about 2344.3 ha /including local access roads with gravel surfacing/, which is 0.8% of the agricultural land of Shabla Municipality /284 433 ha/. The total area of all constructed or realisable facilities would be approximately 1270.9 ha, which is 0.4% of the agricultural area of the Shabla Municipality. The impact can be considered insignificant.

- On the land of the villages of Gorichane and Prolez.

On the land of the villages of Prolez and Gorichane, with an area of 42.9 km2, 141 facilities were advanced with the evaluated investment proposal. There will be 0.3 km2 per generator if all the designed ones are built.
In the case of implementation of the evaluated IP, the rotor diameter is up to 163 m or the rotor volume is 89 729 cubic metres. If built with the same rotor diameter /although the minority of announced IPs have such a large rotor diameter, and the largest rotor diameter of the wind turbines already built does not exceed 93m/, all 141 installations would occupy 0.01% of the airspace above the villages of Prolez and Gorichane.

It should be noted that the area of the proposed investment is the most suitable for wind energy production, as it has the best wind potential and the lowest bird migration parameters.

The lost field area for hunting/feeding birds on agricultural land for all 141 facilities would be about 1073 decares /including local access roads with gravel surfacing/, which represents 2.7% of the agricultural land of both countries /Prolez and Gorichane - a total of about 39750 decares/. The total area taken up by all the 47 constructed or feasible facilities would be about 357.7 ha, or 0.9% of the agricultural area of the two areas. The impact is considered to be insignificant.

6.7. Harmful physical factors (noise, vibration and electromagnetic radiation) generated during each phase

6.7.1. Construction phase

According to the requirements of Regulation No. 4 of 27.12.2006 on the limitation of harmful noise by means of sound insulation of buildings in their design and on the rules and norms for the execution of construction works with regard to noise emitted during construction/2007), the protection of the construction site from construction noise sources and the measures provided for this purpose are required as mandatory elements in the organisation of construction activities. These measures must ensure that noise levels comply with the site protection standards.

The normative document regulating noise during construction is REGULATION No. 4 of 27.12.2006.

The main sources of noise are the noisy and very noisy construction works to be carried out on the site, which will be carried out with machinery defined in Annex 1 of the 2006 Regulation on essential requirements and conformity assessment of machinery and equipment operating outdoors with regard to noise emitted into the air.

The statutory 'very noisy works' on the site will include:

- concrete breaking (during the closure phase)
- hammer blows
- drilling
- cutting with an angle grinder
- sharpening of tools
- striking with earth-moving machinery, scraping off material stuck to the bucket of an excavator, etc.
- chiselling and similar activities.

Noise abatement measures during construction for noisy and very noisy activities are justified and depend on:

- the distance between the construction site and neighbouring buildings and premises (more than 600 m - no measures are required for more than 600 m);
- - the time of day and week during which the work is carried out (it is accepted that work is carried out only on working days from 7.00 to 19.00, excluding Saturdays and Sundays);
- - the duration of noisy and very noisy works (the duration of noisy works is accepted from 1 to 8 weeks and of very noisy works less than 1 week);
- - the noise level in the types of development zones (the area of the investment proposal is manufacturing, sufficiently distant from the residential area - Gorichane and Prolez villages)..

Мерките за ограничаване на шума се класифицират в три групи: А, Б и В.

Table 6.7.1. Noise abatement measures

Group of measures	**Noisy and very noisy construction site works and transport that are:**	**Machinery, appliances and means of transport that comply with:**	**Group of measures**
A	Without impact	Normal performance (standard equipment)	A
B	With limited impact	generally recognized equipment (according to current European Union directives)	B
C	With significant impact	latest equipment	C

In this case, group A (production area, annoyance level IV, duration of very noisy activities up to 1 week and of noisy activities from 1 to 8 weeks) should be selected from the groups of noise abatement measures in relation to the annoyance caused by the noise, depending on the predicted harmful effects and annoyance. A minimum of Measure Group A is required for vehicles on site. According to the legal requirements, Measure Group A is met when:

- vehicles serve the site between 7 am and 7 pm;
- the number of journeys made by vehicles serving the site is a maximum of 300 journeys per day on 10 working days and an average of up to 50 journeys per day on other days.

According to the legal requirements, the investment project (part of the ESDP) must include an analysis of the noise sources at the construction site and a description of the noise abatement measures during construction, depending on the chosen site location, the distances to neighbouring buildings, the duration and phases of construction, the duration of work during the day and the week, as well as the construction machinery and means of transport used.

6.7.2. Operational phase

Any working mechanical system generates sound waves from the vibrations of its individual mechanisms and devices as they move, rub, impact, etc. Noise is therefore inevitable in the operation of wind turbines. However, in addition to mechanical noise, wind turbines also generate aerodynamic noise caused by the rotation, vibration, friction and other interactions of the rotor blades with the airflow around them. This noise mainly depends on the rotor speed and the aerodynamic control of the rotor.

The investment proposal foresees the construction of 7 wind turbines, which will operate all year round, and the associated infrastructure. In reality, however, the wind turbines do not run continuously - they stop when there is no wind or when the wind speed is below 2.5 m/s or above 25 m/s, and during repairs and maintenance of the plant.

Noise is generated by several different parts of the turbine: the generator, the gearbox, the contacts between the

hub and the support tower, which together generate mechanical noise. There is also aerodynamic noise from the rotation of the blades. The combination of wind turbine noise can be described as mechanical noise, such as from a moving car, combined with aerodynamic impulse whistling from propeller movement.

This noise is only produced when the turbine is running. For horizontal turbines, this occurs at wind speeds of 4 m/s to 30 m/s. At speeds in the range of 6 - 7 m/s, the turbine operates with relatively low levels of wind noise. At wind speeds of around 10 m/s and above, the wind noise masks the turbine noise.

The human ear can distinguish a difference of at least 3 dB(A) above ambient noise levels; the smaller difference is masked by ambient noise. Most current turbines in populated areas (with small capacities) produce values very close to ambient levels.

Although under certain conditions the noise intensity from the wind turbine may be the same as the ambient frequency, the ambient frequency may be different. The noise from the turbines may therefore be distinguishable from the ambient noise, although not more intense. This is not an absolute rule. In fact, if you listen carefully, you will be able to identify all the other components of ambient noise: barking dogs, car traffic, tractor noise, even trees.

For the purposes of the Environmental Noise Protection Act and Order No. 6 of 2006, noise from wind turbines should be defined as permanent, with a time-varying level dependent on wind speed.

Different wind turbines will generate different levels of noise. As the client has not yet finalised the type of wind turbines to be used, the assessment will be carried out for the currently proposed 4.5 to 8 MW turbines.

Noise level of wind turbines VESTAS V163-4.5 MW

The sound power levels emitted during operation of the V163-4.5 MW wind turbines are presented in VESTAS document 0130-7822.V00/2022-08-31. The sound power levels are presented in tabular form.

Table 6.7.2. Data on sound power levels generated at different speeds

VESTAS V163 - 4.5 MW											
Wind speed (m/s)	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Noise level dB(A)	**92.3**	**93.3**	**96.8**	**100.6**	**104.2**	**107.3**	**108.4**	**108.4**	**108.4**	**108.4**	**108.4**

Construction phase

- **Level of impact -** significant at the project site and along the transport route and insignificant in the contact areas - minimal increase in noise characteristics is not expected compared to the current status;
- **- Territorial scope-** small /up to 150 m from the site and up to 50 m from the road route/;
- **- Duration of impact -** short term - not more than 1 year;
- **- Frequency of impact -** periodic for the site area depending on the specific works;
- **- with the likelihood of cumulative and synergistic effects** (due to the presence of other investment proposals in the area).

Operational phase

- **Level of impact** - significant in close proximity to wind turbines under certain meteorological conditions;
- **Territorial scope** – small /up to 500 - 600 m/;
- **Duration of impact-** long term (lifetime of the WPP is 20 years);
- **Frequency of impact -** periodic under certain meteorological conditions;

- **with an increased likelihood of cumulative and synergistic effects** (with the wind turbines previously applied for in the area).

Cumulative noise effect of WPP operation. Noise map of the WPP.

It is known that there are other investment proposals for wind turbines in the area under consideration. Data on their location and characteristics have been collected by the municipalities and RIEW-Varna. These wind turbines are at different stages of the procedure. The following cases were identified:

- Wind turbines already built (cumulative impact assessment is mandatory);
- Wind turbines at the stage of building permit (there is a high probability that these wind turbines will be built and they should be included in the cumulative impact assessment);
- Wind turbines at the planning permission stage (the likelihood of these wind turbines being built is relatively high and they should be taken into account when considering the cumulative effect);
- Wind turbines that have developed master plans (similar to the above);
- Wind turbines with a master plan development consent (these are the least likely to be built and should only be considered when modelling worst case impacts).

Based on the assumptions and constraints adopted, the area of potential impact and the sites (receptors) subject to hygiene protection have been identified.
The sites are divided into two main categories:

1. Recievers with a high potential for noise exposure - populated areas within the 3 km contour:
   - Gorichane village;
   - Prolez village;
   - Rakovski village;
   - Poruchik Chunchevo village.

2. Recievers with a low potential for noise exposure – populated areas outside the 3 km contour:
   - Vidno village;
   - Hadzhi Dimitar village;
   - Gorun village;
   - Shabla village.

The assessment of the acoustic situation in case of independent and simultaneous operation of the hydroelectric power plants "Prolez", "Gorichane" and "Gorichane 2" is made under the following conditions:

- Wind speed at a height of 10 m - 8 m/s;
- Sound power level emitted by the wind turbine - 109.4 dBA.

At the previous stage of development, estimates were provided of the cumulative effect of implementing the wind farm without reducing the number of turbines and for turbines with worse noise characteristics.

The conclusions of these assessments are that the cumulative effect of implementing the park would be insignificant and acceptable.

For the purpose of analysing the cumulative effect of the implementation of the present investment proposal, the predicted noise levels in the populated areas from the simultaneous operation of the 7 wind turbines of the Prolez WPP are presented in Table 6.7.8 (7 turbines in this report).

Table 6.7.8. - Sound pressure level, dBA

Town/Village	Sound pressure level, dBA		
	Background	When 7 turbines are working	Total noise level
Prolez	30 ÷ 35	30 ÷ 32	31 – 33
Gorichane	30 ÷ 35	30 ÷ 35	32 – 34
Poruchik Chunchevo	30 ÷ 35	< 30	31 – 33
Rakovski	30 ÷ 35	< 30	31 – 33
Vidno	30 ÷ 35	< 30	31 – 33

Table 6.7.9 shows the predicted noise levels in the populated areas with the wind turbines already in operation and those planned for the implementation of the Gorichane WPP.

Table 6.7.9. - Sound pressure level, dBA

Town/Village	Sound pressure level, dBA		
	Background	When the planned and realised turbines are working	Total noise level
Prolez	30 ÷ 35	30÷ 37	31.2 - 38.2
Gorichane	30 ÷ 35	30÷ 40	32.0 – 42.0
Poruchik Chunchevo	30 ÷ 35	< 30	31.3 – 36.2
Rakovski	30 ÷ 35	< 30	31.3 – 36.2
Vidno	30 ÷ 35	< 30	31.2 – 36.2

Table 6.7.10. - Sound pressure level at simultaneous operation of all realised, processed wind turbines and the wind turbines of this project

Town/Village	Sound pressure level, dBA		
	Background	When all wind turbines are working	Total noise level
Prolez	30 ÷ 35	42 ÷ 43	43.2 - 44.2
Gorichane	30 ÷ 35	37 ÷ 40	38.2 - 40.2
Poruchik Chunchevo	30 ÷ 35	30 ÷ 33	31.3 – 34.2
Rakovski	30 ÷ 35	30 ÷ 35	31.3 – 34.2
Vidno	30 ÷ 35	35 ÷ 42	31.2 – 34.2

The analysis of the results of the calculation of the cumulative noise impact of the simultaneous operation of the implemented and planned wind turbines of the WPP "Prolez", WPP "Gorichane" and WPP "Gorichane 2" shows that:

- In the case of stand-alone operation of the Prolez WPP, the maximum predicted noise level at night with simultaneous operation of the wind turbines envisaged by the project in the villages of Prolez and Gorichane is 31-33 and 32-34 dBA, respectively, and in the remaining villages it is below 33 dBA;

- - With the joint operation of the Prolez WPP and the generators implemented so far, the maximum predicted noise level at night in the villages of Prolez and Gorichane is 31.2 - 38.2 and 32.0 - 42.0 dBA, respectively, and in the remaining villages it is below 36.2 dBA;
- - with all implemented, ongoing and ongoing generators operating simultaneously, the maximum predicted noise level at night with all wind turbines operating simultaneously in the villages of Prolez and Gorichane is 43.2 - 44.2 and 38.2 - 40.2 dBA, respectively, and below 34.2 dBA in the remaining villages.

Conclusion:
For all three normative periods - day, evening and night - in the populated areas in the area of WPP "Prolez", WPP "Gorichane" and WPP "Gorichane 2" with simultaneous operation of wind turbines noise levels lower than the limit values according to Regulation 6 are guaranteed, i.e. at this stage of WPP design it is not necessary to develop measures to reduce the noise level from the operation of wind turbines.

In accordance with the methodology described in ISO 9613, a conservative model was constructed based on the following conditions:

- Atmospheric pressure - 1013.25 mbar;
- Relative humidity - 60%;
- Temperature - 20°C;
- Ground effect (Agr) - G=0.5;
- Turbine sound power level in mode 0 - 109.4 dB(A);
- Wind speed at the level of the blade axis (propeller) - 12.6 m/s;
- Sound power level in octave bands, in decibels
- Height of turbine (propeller) - 105.0 m.
- Height of impact object (receiver) - 8.0 m ± 0.2
- 1^{st} floor – 2 m
- 2^{nd} floor – 2.8m
- 3^{rd} floor – 2.8m

To reduce the uncertainty in the model caused by the ground attenuation effect, the method specified in section 7.3 of ISO9613-2 was used:

- Method 1 - applied to a flat/smooth ground surface with negligible variation in terrain slope combined with sound power level data in octave bands.

The wind turbines are designed to operate all year round. In practice, however, the wind turbines do not operate when there is no wind, or when the wind speed is less than 4 m/s, or when the wind speed exceeds 25 m/s. Their operation is also interrupted during maintenance work. For the purposes of the Environmental Noise Protection Act and Ordinance No. 6 on the indicators of the level of annoyance during different parts of the day and night, the limit values of the indicators of the level of annoyance, the methods for assessing the values of the indicators of the level of annoyance and the harmful effects of noise on the health of the population, the noise from wind turbines shall be defined as a permanent, time-varying level depending on the wind speed.

The predicted acoustic environment within the 3km radius of the proposed, constructed and planned wind turbines operating simultaneously is presented using noise maps.

The impacts presented below for the forecast with the originally proposed number and type of wind turbines indicate that by selecting a reduced number of generators of a less noisy type, the potential impacts would be significantly less likely to exceed acceptable impact levels. In this context, the conclusions on the cumulative impact of adverse physical factors generated by the current wind farm are as follows:

Cumulative effects of harmful physical agents

<u>Ionising radiation</u>

The construction of a certain number of wind turbines has not contributed to an increase in the amount of non-ionising radiation emitted, so there is no possibility of cumulative effects from joint activity with other IP of a similar nature in the vicinity.

Non-ionising radiation

During the operation of the proposed investment, the level of such radiation will increase insignificantly at the expense of the power transmission networks, but will be significantly reduced due to the fact that the cable ducts are buried in the ground and are reliably shielded. The impact would be minimal, with limited, negligible cumulative effects.

Thermal radiation

The investment proposal has no impact on the occurrence of cumulative impacts on this component during its operation.

Acoustic environment

The assessment of the acoustic situation in the area was based on statistical data, field measurements and additional calculations. The impact of the generated noise levels at the protected receptors (the nearest dwellings to the village of Neykovo) will reach levels below the normative permissible values, i.e. it is concluded that the noise level will be mainly determined by the own noise background;

The implementation of the investment initiative will contribute to a temporary increase in noise levels in the implementation area due to the use of construction machinery.

Therefore, when calculating the cumulative effect, the experts have used the available data (despite the fact that some of them include IPs with EIA decisions with a deadline longer than the legal deadline), assuming maximum indicators, and the cumulative effect is based on the potential worst case scenario.

The results of the calculations carried out show that the equivalent noise level generated by the park during its construction will be minimal at the distance where the nearest residential areas are located (the impact site). As the implementation of such sites is definitely in a larger area, there is no possibility of cumulative effects caused by this factor.

Vibrations

Wind farm construction activities will generate some vibration levels only during the construction of the turbine foundations. These activities will generally be short term, temporary and of minimal significance in terms of vibration generation compared to activities at other adjacent sites.

The effects of induced vibration will be temporary, limited to the site area, minimal, and will not have cumulative and combined effects on environmental components and human health.

The emitted noise will not lead to the deterioration of the acoustic environment parameters, as the noise levels will be lower than the sanitary norms according to the Regulation No. 6 of the Ministry of Health and the Ministry of Environmental Protection on the environmental noise indicators, taking into account the degree of discomfort during different parts of the day, the limit values of the environmental noise indicators, the methods for assessing the values of the noise indicators and the harmful effects of noise on the health of the population - 45 dBA at night.

The analysis of the results of the cumulative noise impact calculations for the simultaneous operation of all wind turbines in the 3 km zone shows that the noise levels are within the permissible limits.

In order to compare the noise levels, a graph comparing the noise levels in different situations is shown in Figure 6.7.2-8. For example, the noise background at night in a village is between 20 and 40 dB(A), the noise from a light car travelling at 64 km/h is 55 dB(A), the noise background in an office is about 60 dB(A), the noise from a lorry travelling at 48 km/h at a distance of 100 m is 65 dB(A).

Ultrasound and infrasound

One of the fundamental properties of sound is its frequency. The frequency of a sound is equal to the oscillation frequency of its source, i.e. it is the number of complete oscillations that this source makes per unit of time.

The human ear can only hear sounds with a frequency greater than 16 hertz and less than 20,000 hertz. Sounds with a frequency below 16 Hertz are called infrasound, and those with a frequency above 20,000 Hertz are called ultrasound. We do not hear these sounds.

Ultrasound is sound with a frequency above the upper limit of human hearing, which is about 20 kilohertz. Some animals such as dogs (up to 45 kilohertz), dolphins (up to 150 kilohertz) and bats (up to 110 kilohertz) have a higher threshold than the human ear and can hear ultrasound.

According to the Swedish Environmental Protection Agency, the levels of ultrasound emitted by the turbines are so low that they do not cause any damage to health.

According to the latest definition (adopted at the International Symposium in Paris in 1973), infrasound is the frequency range from 0.1 to 20 Hz. For a long time, infrasound was mainly associated with natural phenomena - volcanic activity, earthquakes, storms, ocean waves, changes in atmospheric pressure, etc. The first reports of infrasound date back to the exploration of the northern seas. Systematic research into these problems has taken place in the field of underwater and atmospheric acoustics. It is known that infrasound is also produced by human activity - bombing, chemical and nuclear explosions, even walking, swimming, etc. In recent decades, attention has also been paid to the technical causes of infrasound. A number of manufacturing and transport activities have been found to be associated with relatively high levels of infrasound, increasing the occupational health significance of this factor in the working environment. Although it is physically similar to sound, infrasound has certain characteristics that increase its harmful effects. These are the low absorption of infrasound energy (at a purity of 10 Hz it is 104 times lower than for a sound wave at a frequency of 1000 Hz) and the propagation of infrasound over long distances.

The main sources of infrasound in the production environment are: compressors, turbines, internal combustion engines, furnaces in metallurgy, steelworks, fans, auxiliary electric motors and pneumatic units, vibrating equipment in machine rooms, in water transport, in all means of transport, in excavators, bulldozers, cranes, etc.

Despite the lack of standardised infrasound measuring equipment, there is a range of data from production measurements on the infrasound levels and purities of individual sources. From a hygiene point of view, it is important to note that in the workplace, infrasound is most often found in combination with low-level noise or as a component of broadband noise. Industrial infrasound is much more intense than infrasound caused by natural phenomena. It should be noted that, unlike other factors in the working environment, the characterisation of infrasound sources is currently relatively poor and incomplete. It is important to note that both the number of industrial infrasound sources and their intensity are increasing.

Infrasound and vibrations are generated when wind turbines operate. This occurs at the end of the blades where vortices are formed, which are the actual source of the infrasound. The magnitude of the effect increases as the power of the wind turbine increases. The frequency of these oscillations is 6-7 Hz, which is the frequency of the human brain, so some psychotropic effects are possible. However, this is still a hypothesis that needs to be scientifically proven. Compared to other sources of infrasound (railways, cars, trams, etc.), wind turbines are many times safer.

Vibrations

In general, wind turbines are sources of vibration. The vibrations generated are common, with frequencies around the turbine operating frequency (0.14 to 0.33 Hz). They can be emitted in the event of poor installation of the equipment and in the event of a foundation that is not sufficiently resilient to dampen the vibrations generated.

Vibrations are generated in the following way: the tangential and normal accelerations, which act as stresses on each blade and in the nacelle sweep, cause stresses on the mast, whose point of moment application moves according to a cyclic law. This results in the transmission of low-frequency vibrations with a periodic

component, whose fundamental wavelength is a multiple of the height of the mast, at the base of the mast, from the heel to the nacelle bearing. The magnitude of their amplitude can be determined, but it is necessary to know the angle of attack of the wing relative to the enveloping airflow, the mass of the propeller and the mass of the nacelle.

If the dynamic volume of the circulating flow, together with the propeller and the mast, corresponds to a 3-D attractor (2 connected rings in two mutually perpendicular planes), then from the laws of energy conservation, the difference between the wind speed (at grade 3) and the energy yield provides about 40 kW of energy which is parasitic and dissipated as noise and vibration.

To date, there is no worldwide evidence of high levels of general vibration around such installations, and even this factor is not considered harmful in their vicinity. Clearly, if the manufacturer's requirements are met, vibration in wind farms does not appear to be an environmental problem.

In addition, vibrations have a greater impact on neighbouring buildings and structures, but there are none in the WPP area. Methods to reduce them are also well known and effective. In general, if a suitable aerodynamic profile is chosen for the blades, the wind turbine is well balanced and regular technical inspections and maintenance are carried out, vibrations will not occur at all.
The vibration activity of the turbine in our case is determined by the following dynamic forces:
The propeller speed is 30 rpm.
The frequency manifestation of the dynamic forces of the wind turbine is
- - Inertial forces due to fin imbalance - 0.5 Hz;
- - Aerodynamic forces:

from I blade harmonic - 1,5 Hz; from II blade harmonic - 3,0 Hz.

According to the data of the vibration condition of the tower of a similar wind turbine, it was found that the first natural frequency of the tower is in the frequency range of 5 ÷ 10 Hz.
Therefore, the dynamic forces caused by the operation of a wind turbine cannot cause resonance phenomena in the foundation-wind turbine system and cannot cause increased vibrations in its surroundings.

Electromagnetic interference

In general, it is possible for wind turbines to cause electromagnetic interference to aircraft radar and telecommunications systems (e.g. microwave, television, radio). This interference can be caused by three main mechanisms, namely near-field effects, diffraction and reflection or scattering. The nature of the potential effects depends on the location of the wind turbine in relation to the transmitter and receiver, the characteristics of the rotor blades, the frequency signal received, and the propagation characteristics of radio waves in the local atmosphere.

Air traffic radar

Wind farms located near an airport can affect the performance of air traffic control radars by causing signal distortion that can result in signal loss and/or erroneous radar display signals. These effects occur due to tower and rotor comet reflections and radar oscillations.

There are no operational air traffic radars in the vicinity of the wind turbines in an area that could cause electromagnetic interference.

Telecommunication systems
Measures to prevent and control the impact of telecommunications systems include
 Modifying the placement of wind turbines to avoid direct physical interference with point-to-point communications systems;
 Installation of a directional antenna;
 Modifying the existing antenna;

 Installing an amplifier to boost the signal.

At this stage, there is no reason to believe that any of the above measures will be necessary due to the chosen location and type of wind turbines.

Television

Measures to prevent and control the effects of TV broadcasting include:

- Use of non-metallic turbine blades - implemented by the type of wind turbine selected;
- If interference is detected during operation:
- Install a higher quality or directional antenna;
- Aim the antenna at an alternative transmitter;
- Install an amplifier;
- Move the antenna;
- in the case of a larger area - build a new repeater station.
- Placing wind turbines out of sight of the transmitter.

At this stage, there is no reason to believe that the above measures will be necessary due to the chosen location and type of wind turbines.

Taking into account the available information, the following general conclusion can be drawn on the environmental impact of the energy risk factors (mainly noise):

Construction phase

- Degree of impact - significant for the project site and along the transport route and insignificant for the contact areas - no deterioration in noise characteristics is expected from the current status;
- - territorial scope - small /up to 100 m from the site and up to 50 m from the road route/;
- - Duration of impact - short term - not more than 1 year;
- - Frequency of impact - periodic for the site area, depending on the specific works;
- - with the likelihood of cumulative and synergistic effects (due to the presence of other investment proposals in the area).

Operational phase

- Degree of impact: significant in close proximity to wind turbines under certain meteorological conditions;
- - territorial range - small /up to 500 - 600 m/;
- - Duration of impact - long (the lifetime of the WPP is 20 years);
- - Frequency of impact - periodic under certain meteorological conditions;
- - with an increased likelihood of cumulative and synergistic effects (with the wind turbines already applied for in the area).

Vibrations will not be a risk factor for human health because they are technologically unacceptable (they can cause defects in the wind turbine).

For electromagnetic fields at the industrial frequency (50 Hz), it is assumed that the absence of exposed overhead lines and open-air switchgear also makes this factor insignificant as a risk to the health of the temporary or permanent population living around the site (therefore no calculations are required).

6.8. Health risk to the public and workers at the site

Based on the analysis of the location of the site, the selected technological equipment, the intended mode of operation and the climatic and geographical characteristics of the area, two groups of potential risk factors for

human health are identified:

– During construction - dust from excavation and construction activities, exhaust fumes from construction and transport machinery and noise from the same;

– During operation - noise (and possibly vibration) from wind turbines, electromagnetic fields, visual changes in the landscape, partial shading of neighbouring areas and other optical effects. Harmful factors to the health of the potentially affected population during both the construction and operation of the investment proposal have been clarified. It was found that the main harmful factor during both periods will be noise from various sources. In this context, the focus of the environmental, health and welfare impact assessment of the current investment proposal is on the one hand on the identification of potentially affected persons and areas according to the criterion of national noise hygiene standards for the built environment, and on the other hand on an assessment in terms of experience in advanced countries (according to good practice principles).

Vibrations will not be a risk factor for human health because they are technologically unacceptable (they can lead to the failure of wind turbines).

For electromagnetic fields of industrial frequency (50 Hz), it is assumed that this factor also loses its significance as a risk to the health of the temporary or permanent population living around the site due to the absence of exposed overhead lines and outdoor switchgear (therefore no calculations are required).

The exposure to the identified potential risk factors to human health will be different for the population of the nearest populated areas and for those working on the site during its construction.

During the construction phase, the population in the populated areas closest to the site will not be exposed to excessive levels of dust, fumes and noise from construction and transport equipment. In any case, these impacts (other than noise) are expected to be significantly limited in time and distance (maximum 50-60 m) and will not have a practical adverse effect on the health of the population. With regard to noise during construction of the site, it has been established that even under the most adverse conditions (e.g. mole activity), the levels of this factor would be lower than those permitted in relation to the nearest populated areas.

In practice, the population of the nearest populated areas will not be exposed to the identified main harmful factor - noise - during the operation of the site. This will result in minimal exposure only for temporary residents in the immediate vicinity of the site.

Workers on site will be exposed to the same harmful factors on a larger scale, but for the duration of construction.

At present, there are no regulated minimum hygiene and protection zones around this type of facility. Among European countries, the most stringent in this respect are the criteria of the German state of North Rhine-Westphalia, where a minimum distance of 300 m between the wind generator and an occupied building must be ensured in order to obtain a permit for the commissioning of wind turbines. The sites of the proposed investment are more than suitable in this respect - they are more than 600 m away from a built-up area. This is a sufficient condition for the expected minimal and insignificant impact on the nearest populated areas.

The fact that there are no "sensitive" buildings in the area (kindergartens, schools, hospitals, nursing homes) and that the population is small should also be taken into account.

Noise impact

Noise will have an impact both during construction and operation of the site. However, the noise sources and their technical and operational noise characteristics are quite different. During construction, the noise sources will be construction machinery and vehicles transporting materials and equipment. The expert opinion is that the noise during this phase will be limited in spatial and temporal extent and will not lead to adverse changes in the acoustic situation of the nearest populated areas.

Any working mechanical system generates sound waves from the vibrations of its individual mechanisms and devices as they move, rub, bump, etc. Noise is therefore inevitable in the operation of wind turbines. However, in addition to mechanical noise, wind turbines also generate aerodynamic noise caused by the rotation, vibration, friction and other interactions of the rotor blades with the air flow around them. This noise mainly depends on the rotor speed and the aerodynamic control of the rotor. For example, for variable pitch blades, the noise is lower in

wind speed ranges up to 12-13 m/s, while it is higher for fixed pitch blades.

The type of aerodynamic noise can include low frequency, tonal and continuous broadband noise. In addition, the amount of noise can increase as the blade speed of the turbine increases, so turbines that allow lower blade speeds in stronger winds (such as the one selected by the Client) will limit the amount of noise generated.

Historically (more than 15 years ago), the problem of infrasound generated by the wind turbines of the time was very serious. This problem has now been solved by the appropriate aerodynamic design of the propellers, the introduction of electronic control systems for the equipment, etc.

The specific effects of noise on human health are quite difficult to determine, partly because sensitivity to noise varies greatly between individuals. Noise has two types of health effects: specific and non-specific.

The non-specific effects of noise on the body reflect its effects as a chronic stressor, primarily on the nervous system. The balance between excitatory and inhibitory processes is disturbed. Conditions of asthenic-neurotic syndrome or circulatory dystonia predominate. Subjective complaints are unspecific: headache, depression or irritability, emotional lability, insomnia. Neurologically, the most common symptoms are reduced reflexes, tremor, nystagmus, prolonged visuomotor reaction time. With prolonged exposure, perception is impaired, attention is weakened, mental concentration is disturbed, mood lability, apathy or irritability, distractibility and a decrease in the pace of work appear, and with chronic exposure - overwork with the development of neuroses of neurasthenic type. The quality of work deteriorates, work and production errors increase, work capacity and productivity decrease.

The autonomic nervous system is particularly sensitive to noise. Changes have been shown to occur at relatively low noise levels (50/70 dBA). Peripheral vascular dystonia, distal hypothermia and skin temperature asymmetry, hyperhidrosis and dermographism are the most common. Complaints of heart pain, tachycardia and headache were common. Changes in the autonomic nervous system occur most frequently during the first years of noise exposure and are more pronounced in younger workers. Changes in the cardiovascular system during noise exposure are significant. Both hypertonic and hypotonic reactions of the vascular system may occur, depending not only on the noise parameters but also on the individual characteristics of the organism and the type of work performed. Changes in arterial pressure under the influence of high-frequency noise are more frequent in young workers with a short work experience (2/3 years). They are more pronounced in occupations with increased demands on the performance of the production task - e.g. drivers, etc.

Other organs and systems are also affected. Changes in the motor and secretory function of the gastrointestinal tract have been noted, manifested by hypacidity and decreased gastric tone. Gastrointestinal disorders (gastritis, ulcers) are more common in workers exposed to high noise levels. Changes in the endocrine system as a result of noise exposure are not well understood. The most common is thyroid dysfunction with evidence of hyperthyroidism. Noise is also thought to affect the adrenal glands, pituitary gland and hypothalamus. Changes in epinephrine and norepinephrine levels support the role of noise as a major environmental (including occupational) stressor. There are also changes in the musculoskeletal system - a reduction in muscle strength and endurance of up to 25%, reduced motor responses, prolonged latency, especially when exposed to high frequency noise. These changes are associated with disturbances in the dynamics of cortical processes and the retentive state of the motor analyser.

Of particular importance is the effect of noise on analysts. Changes in the vestibular system are mainly observed at high noise levels and are characterised by dizziness, drowsiness and headaches. Vestibular changes increase progressively with occupational noise exposure, but also occur in young workers.

Data on changes in visual function are inconsistent, which can be explained by differences in noise exposure parameters and exposure. Short-term changes in visual acuity have been reported at high noise levels (above 100 dB), and at lower levels (75 to 90 dB) changes in the duration of clear vision and the critical flicker fusion frequency have been reported.

Extra-aural (beyond the hearing analyser) changes, especially those involving the nervous and cardiovascular systems, occur significantly earlier than the development of hearing loss. There is evidence that extra-aural symptomatology tends to stabilise as auditory changes progress [7*]. Thus, in practice, non-specific changes predominate in those with less work experience, whereas hearing impairment becomes more prevalent with

increasing work exposure.

Noise causes three specific forms of damage to the hearing analyser:

- Temporary (transient) hearing loss - acute fatigue of the hearing analyser;
- Permanent hearing loss - occupational hearing loss;
- Acute acoustic trauma.

Temporary (transient) hearing loss occurs with short-term noise exposure and at the beginning of work experience in noisy industries. The changes are functional and reversible. With proper rest and a prophylactic regime, hearing is fully restored.
Permanent hearing loss (occupational noise-induced disease) occurs with prolonged exposure to high noise levels, the timing of onset and progression and the percentage of workers affected depending on the main factors already mentioned. Hearing loss is of the acoustic type, cochlear neuritis. This occupational neuritis of the auditory nerve (known as "occupational hearing loss") is always bilateral, with varying degrees of threshold asymmetry, depending mainly on the working posture.

Occupational hearing loss is characterised by an initial hearing loss at high frequencies (4 000 Hz). Depending on the noise exposure, this impairment usually occurs after 5 to 7 years of working in noisy environments. It is chronic and progressive. As the disease progresses, low-frequency (speech) hearing is affected, which is objectified not only by instrumental tests but also by the subjective perception of hearing loss by the worker.

There are different classifications of the degree of hearing loss based on different altered indicators. In general, however, the first stage of occupational hearing loss is characterised by mild changes in hearing threshold with preserved speech communication. The second, moderate stage is often associated with irreversible changes in hearing, including speech intelligibility. In the advanced, severe form of hearing loss, the loss of hearing sensitivity is pronounced (more than 50%, i.e. up to 60/70 dB), the changes are irreversible and lead to loss of working capacity.

The risk of hearing loss for workers after 10 years of exposure has been shown to be 10% at 90 dB/A, 29% at 100 dB/A and 55% at 110 dB/A.

Very intense noise (blasting, engine testing, etc.) can cause acute acoustic trauma - acute pain and noise ("ringing") in the ears, rupture of the eardrum with bleeding from the external auditory canal, dizziness, nausea, vomiting, loss of balance, acute hearing loss in the affected ear.

At typical sound levels near wind farms (about 60 dB(A) at the base of the turbine, 45 dB(A) at 300 m), specific effects on the auditory system cannot be predicted.
The non-specific effects are mainly of a psychological nature and mainly concern the perception of disturbance (anxiety). This annoyance is related, on the one hand, to the perceived sound levels and, on the other hand, to the general perception of wind energy and of the project in particular (landscape effects, shadows, etc.).

Disturbance has been the subject of many studies that have emphasised the impact of non-acoustic factors that have a secondary influence. In fact, most socio-acoustic studies have shown that annoyance (anxiety) is determined (or explained) too much by acoustic factors (about 30 to 40%). Non-acoustic factors that may play a significant role are:

1) situational factors, i.e. factors that model individual noise exposure;
2) individual factors: socio-demographic factors (gender, race, level of education, location of residence, occupational dependence on the noise source, use of the source) and behavioural factors (sensitivity to noise, fear of the source) and, above all, personal expectations regarding the visual and auditory landscape (some people do not want their visual and auditory landscape to change);
3) social factors, which reflect the behaviour of social groups rather than individual behaviour. At least

four factors are listed here: lifestyle, image of the noise source, expectations of noise development, trust (or mistrust) of individuals in the behaviour and actions of public authorities;

4) Noise source factors: the 'new infrastructure' effect (in comparative acoustic exposure, new infrastructure is more annoying than the existing situation), the 'multiple exposure' effect, etc.;

Apart from the disturbance, exposure to noise in general can be the cause of sleep disturbance. The frequent presence of bass tones at high levels is an aggravating factor in terms of sleep and rest disturbance. Chronic exposure to noise can affect the autonomic system, particularly the cardiovascular system, or mental health.

Biological effects of infrasound

The biological effects of infrasound are still poorly understood, both in terms of their nature and their mechanism of action. The first more systematic studies were carried out in the 1960s. Infra-sound is not perceived by the ear, but by the skin, in particular by the Vater-Pacini corpuscles, the same receptors that respond to vibration. With regard to the mechanism of action of infrasound, the possibility of resonance phenomena occurring in internal organs with pronounced changes, including in the microstructure of individual cellular elements of tissues, should be emphasised. Characteristic of infrasound (as opposed to sound) are thresholds of perception, harmful effects and pain close in intensity, with differences of up to 15-20 dB. The effects of infrasound have been studied mainly in human and animal experiments. The most commonly used infrasound parameters are 90-135 dB for frequencies of 4-8 Hz. Intensities up to 144-160 dB have also been studied for very short exposures. A 10-min exposure to 170 dB infrasound has been found to be lethal in some animals. Industrial workers have also been studied. All authors reported the occurrence of a number of subjective complaints - fatigue, tiredness, headaches, poor sleep, dizziness, heaviness in the stomach, nausea, tinnitus, cough. Characteristically, there is a feeling of pressure and pain in the ears when swallowing, a feeling of vibration and pressure in the thoracoabdominal region, disorientation, loss of balance, anxiety, depression. The percentage of people with complaints depends on the intensity and exposure, and in occupational settings increases with work experience. In people who also work under intense noise exposure, these complaints are much less common. This is explained by the masking effect of noise. On the other hand, it is known that humans and animals with an unstable autonomic nervous system sense natural disasters associated with infrasound radiation in advance. The effect of infrasound on gender and age is not clear.

Experimental studies with animals at different parameters and exposures to the infrasound phenomenon are carried out using biochemical, histochemical and other morphological methods. A number of abnormalities in major organs and functions have been reported which, although non-specific, indicate serious damage to living organisms as a result of the infrasound effect. Disturbances in oxidative and bioenergetic processes, changes in enzyme activity, increase in corticosteroids in the blood and decrease in the level of catecholamines in the adrenal gland, impaired glucogen content in the myocardium, increased acetylcholine content, changes in cholesterase activity, etc. are found.

It is believed that disturbances in the sympathetic-adrenal system lead to changes in the trophic state of internal organs (brain, myocardium, liver), expressed in microcirculatory and other ultrastructural changes. In animals exposed to intense infrasound (7 Hz and 170-190 dB), dilated blood vessels and haemorrhages in the lungs were observed. Changes in immunological reactivity have been found. The combined effect of infrasound and electromagnetic fields has been reported to increase these changes. In experienced persons and workers exposed to the influence of infrasound, disturbances in the functional state of the central and autonomic nervous systems, respiration and analysers are objectively detected. The neurological status does not usually show any specific changes, but there are disturbances in the emotional-volitional sphere with a pronounced natural vegetative syndrome. Pulse rate increases, then bradycardia occurs, not infrequently arrhythmia, breathing also becomes rapid, systolic and diastolic pressure increases, skin temperature rises. There are contradictory data on these indicators, which can be explained by different parameters and exposure to infrasound.

Vestibular disturbances and a reduction in visual acuity have been observed among analysts. During work, fatigue is observed in workers, which is directly related to the intensity of infrasound. Electroencephalography shows abnormalities in brain biopotentials; PEO encephalography shows evidence of impaired blood flow and

venous congestion in the brain. Infrasound also affects speech intelligibility.

The biomechanics of the infrasound effect is mainly explained by the occurrence of resonance phenomena, which mainly affect the homodynamics and the internal organs (heart, spleen, liver, brain). The question of the influence of infrasound on the sound analyser has been the subject of numerous experimental and production studies. It is well known that infrasound is "inaudible" to the human ear. However, the close frequency ranges and the combined effect of infrasound and sound, which is common in manufacturing, warrant investigation of the effects of infrasound on hearing. There are a number of reports of observed changes in hearing sensitivity in individuals exposed to infrasound; most authors report transient changes in hearing thresholds that are relatively small, up to 20-22 dB, which recover between shift changes. The maximum intensity of these changes at high frequencies of auditory impact (most commonly 3000 Hz) is similar to that of acoustic impact. Some authors report a maximum effect at 500 Hz. Permanent hearing changes have been found in workers in ship engine rooms. Experimental studies of hearing have been carried out by applying infrasound either directly to the ear (with a headphone) or in special chambers. The quantitative relationship between infrasound exposure and temporal hearing threshold is not well understood. The data obtained by different authors vary widely, mainly due to the acoustic setup of the experiments. For infrasound with a frequency of 2-12 Hz and an intensity of up to 144 dB, a decrease in hearing sensitivity of 10-22 dB was found for 3000-8000 Hz, which was recovered within 30 minutes. The magnitude of the changes depended more on the duration of exposure than on the intensity of the infrasound, e.g. at an infrasound level of 170 dB, no changes in hearing threshold were found after one second of exposure; at 140 dB and five minutes of exposure, 8 dB; at intrinsic intensity and 30 minutes of exposure, 14-17 dB. An infrasound level of 135 dB is considered to be the threshold for hearing loss. There were no inter-individual differences in hearing changes to infrasound. In addition to changes in hearing acuity due to infrasound, other changes in the ear were observed.Vascular hyperemia of the tympanic membrane has been described, which persists after cessation of exposure. Membrane retraction is also characteristic, creating a negative pressure in the middle ear. Tympanic membrane scars in submariners associated with infrasound exposure. The mechanism by which infrasound affects hearing is unclear. It is most likely that resonance plays a role. It is also possible that there are overtones of infrasound waves that can have a direct effect on hearing.

All of the above applies to effects that are specific to the working environment. In the case of RES, the likelihood of the described effects occurring is minimal.

Conclusion

The expert prediction and assessment of the predicted noise impact during construction and operation of the proposed number of wind turbines can be summarised as follows:

– soils

– On the site, the expected maximum sound pressure levels of the various construction activities relative to the populated area boundary will be below the permissible 45 dB(A), i.e. the noise level in the villages of Gorichane and Prolez will be determined by their own noise background;

– During normal operation of the site at wind speeds of 8-10 m/s, the expected maximum sound pressure levels relative to the populated area boundary will be within the limits and in all likelihood lower than the noise level in the populated area.

Therefore, the implementation of the investment proposal alone will not lead to a deterioration of the acoustic parameters of the living environment of the population of the nearest populated areas, and thus - to adverse effects on the health and well-being of people. Even taking into account the cumulative effect of other authorised, approved and/or implemented investment proposals for the installation of wind turbines on the land of the villages, no more significant impact on the population is possible.

It has been calculated that for a single generator operating under the specific field conditions, the required noise hygiene standard of 45 dB(A) for residential areas at night is met at a distance of 300-500 m from the source.

In practice, during the operation of the site, the population of the nearest populated areas will not be exposed to the identified main harmful factor - noise from the generators under consideration. This will result in minimal exposure only for temporary residents in the immediate vicinity of the site. The same conclusion applies when considering the cumulative effect of the other wind turbines in the vicinity.

Workers constructing the site will be exposed to the same harmful factors to a greater extent, but only during the construction and installation period, which is short.

Vibrations will not be a risk factor for human health because they are technologically unacceptable (they can lead to turbine failure).

Noise prevention and control measures are mainly related to engineering design standards. For example, broadband noise is generated by air turbulence behind the blades and increases with increasing blade speed. This noise can be controlled by using variable speed turbines or pitched blades to reduce the rotational speed. These technologies should be considered by the client in the final selection of wind turbines.
Other recommended noise management measures include:

- Appropriate siting of wind farms to avoid locations close to sensitive noise receptors (e.g. populated areas, hospitals and schools) - this has been implemented by the client

– The distances to health receptors are on average more than twice the legal distance;

- Compliance with national and international acoustic standards for wind turbines (e.g. International Energy Agency, International Electrotechnical Commission and American National Standards Institute) - wind turbines selected by the client must comply with these requirements.

Visual impact

According to the reference documents cited in Section 1 of the report, a wind farm can affect visual perception and the landscape, depending on its location and the perception of local residents. Visual impacts associated with wind energy projects typically relate to the turbines themselves (e.g. colour, height and number of turbines) and to impacts associated with their interaction with the character of the surrounding landscape..

Visual impacts are subjective and are not currently regulated.

Measures to prevent and manage visual impacts include:

- Consultation with the public on the location of the wind farm;
- Consideration of the siting of turbines in relation to the character of the landscape;
- Consideration of the visual impact of turbines from all viewpoints when considering siting (see Landscape section);
- Reduction of ancillary structures on site by avoiding fencing, reducing access roads, undergrounding power cables and removing inoperable turbines;
- Avoiding steep slopes, providing erosion control measures and biological restoration of affected areas using only native species;
- Maintaining consistent turbine size and design (e.g. direction of rotation, turbine and tower type, height);

- Painting turbines a uniform colour to match the sky (light grey or pale blue) and comply with regulatory requirements for marine and air navigation markings (see Air Staff Instructions and Regulation No 14);
- Avoiding lettering, advertising, company logos or graphics on turbines.

Another impact on people is related to the subjective and objective effects of visual changes in the landscape, partial shading of neighbouring areas and other optical effects related to the implementation of the investment proposal.

In general, the construction of wind turbines will change the visual characteristics of the landscape. Considering the number of turbines and the size of the area, these changes are not significant. On the other hand, the assessment of these changes is very subjective and individual, and depends to a large extent on each person's personal attitude towards accepting or rejecting what is new. In this sense, both positive and negative reactions are to be expected, i.e. some people perceive these landscape changes and others do not. This is confirmed by the experience in developed countries (i.e. countries where wind turbines have been in operation for a long time and on a much larger scale) - Denmark, Spain, USA, Australia, etc. In these countries, the prevailing attitude of the population is positive and these installations are perceived as normal and undisturbing. In addition, in some countries wind turbines are being built both individually on private farms and in large parks ("farms") next to motorways, even in coastal waters (Denmark), without increasing the number of negative reactions. Wind turbines have also been built in this country and so far there is no evidence of strong negative reactions from the population, which is beginning to get used to them. Visual effects

The construction of wind turbines in the area and their operation will be accompanied by two optical phenomena (effects) caused by the propellers - shading of adjacent areas and light reflection. Both phenomena will be characterised by a periodicity of occurrence depending on the propeller speed, the relative position between the sun, the neighbouring wind turbines and the areas where people are present, and the intensity of the sunshine.

The shadow cast by the propeller(s) is a periodic change in the illumination of a point on the ground, buildings or other objects. Shadows cast by moving turbines can cause unpleasant stroboscopic effects at the level of nearby habitats**.**
The frequency and magnitude of the shadow for a given point is directly related to the speed of the propeller(s) at that time, and the timing of the shadow depends on the diameter and width of the propeller in addition to the above factors.

In this case, the wind farm is well placed in terms of shading from the villages.

Reflection of light (glare) occurs as a result of the sun's rays being reflected off the propeller(s). In addition to the above factors, the angle of rotation of the propellers relative to their axis will also influence the appearance of propeller glare**.**

In practice, neither of the two phenomena of propeller shadowing and propeller glare is an environmental nuisance in itself, but it does have an impact on human comfort. In our country there is no standard that sets an acceptable limit for these effects, so here we will show how the issue is dealt with in the developed countries of Germany and Denmark.

The shading caused by the propellers will affect the areas to the west (Vidno village - distance over 3.3 km), north (Prolez village - distance over 0.6 km) and east (Gorichane village - distance over 0.9 km) of the nearest wind turbines.

Lighting and colouring

There are concerns about lighting. Light sources can be harmful. In adverse weather conditions, such as fog or storms, they have an attraction that can be harmful or even fatal to birds. In order for a light source to have a warning effect, it must be large enough to be seen and small enough to be perceived by birds as a real warning signal.

The only efficient solution would be to light the turbines (masts + blades) from above. In this case, and depending on the size and number of wind turbines (if more than 1), an irreducible source of light pollution would be created in places that are still relatively protected from this phenomenon. In addition, night-time lighting would be a source of disturbance for all nocturnal fauna. It is well known that many overflights take place at high altitudes, mostly at night. The alternative advantages/disadvantages of lighting turbines have not been the subject of thorough scientific studies.

Traumatism

The risks to the public during the construction and operation of onshore wind farms are similar to those of the largest industrial sites and infrastructure projects. These can include the general stability and robustness of the site, fire safety, public access and emergency response and management, which are discussed in the.

Risks to the public specific to wind turbines are:

- Air and sea navigation safety - in our case this is only a potential (theoretical) risk due to the lack of airports in the area;
- "Throwing" of ice and fins;
- Electromagnetic interference and emissions - the distance of the wind turbines from sites where electromagnetic interference could be induced makes this issue irrelevant in this case;
- Public access - The distance from populated areas and the presence of fences make public access almost impossible.

Prevention and control measures to manage public access issues include:

- Use of gates on access roads - not applicable in this case;
- Fencing of the park site or individual turbines to prevent public access to the turbine - not considered at this time;
- Prevent access to turbine tower stairs - to be implemented;
- Post signs about risks to the public and emergency contact information - to be implemented.

Assessment of the potential for combined, complex, cumulative and distant effects of the identified factors

Of the identified potential risk factors to human health, only noise has cumulative effects (chronic stressor). This issue is discussed in detail in Section 6.7.

CONCLUSION: There are currently no factors in the area that pose a health risk to the population. Likely impacts of wind turbines relevant to health risk have been identified. They may occur during construction, operation and decommissioning. As stand-alone facilities, the wind turbines are sufficiently distant from the nearest populated areas that they are unlikely to adversely affect them. In combination with other similar investment proposals in the area, some amplification of adverse effects is possible, but cannot be considered significant (not legally acceptable).
Under normal operating conditions, no adverse health effects are expected for the population of the nearest populated areas and no significant adverse health effects are expected for temporary residents in the immediate vicinity of the site. This likelihood decreases with distance from the site. Thus, the purely subjective psychological effects of the visual change in the environment resulting from the implementation of the investment proposal come to the fore.

6.9. General conclusion on the impact of the investment proposal and compliance with environmental requirements for the selection of the site for its construction.

As a result of the studies carried out, the following general conclusions can be drawn with regard to the environmental and human impact of the investment proposal and the environmental requirements of the chosen location:

- No protected landscapes are affected and there is sufficient distance from populated areas, urban areas and resort complexes;
- Acceptable visual impact - visual compatibility of the chosen area;
- No excessive noise impact, both from the WPP under consideration and from other wind turbines in relatively close proximity, due to sufficient distance from residential areas;
- sufficient distance from locations where television signal interference, reflective lighting and visual changes may occur;
- Absence of unacceptable impacts and protection of protected plant and animal species permanently or seasonally present on the site;
- Sufficient distance from cultural heritage sites and complexes - archaeological and historical monuments;
- No significant impact on protected areas and nature reserves;
- The absence of harmful effects and the preservation of the comfort of life in tourist and recreational complexes in the area;
- Compatibility with existing telecommunications in the area and in the vicinity - radio transmitters, TV, facilities of mobile operators, etc.
- Ensuring flight safety and the operation of airport complexes in the region.

7. A description of the measures envisaged to prevent, reduce and/or, where possible, eliminate significant adverse environmental impacts and a plan for implementing these measures

- **Measures relating to investment design**

1. The design of the excavation works for the foundations of the facility, the installation site, the underground cables and the road accesses shall comply with the requirements of the Decree No. 26/1996 on the Reclamation of Disturbed Land, the Improvement of Poorly Productive Land, the Removal and Utilisation of the Humus Layer /SG 89/1996, 30/2002/, as the humus layer shall be collected and used for the reclamation of the site or other sites in the area.
2. The foundation shall be designed in accordance with the specific geological conditions and in accordance with the requirements of the Standards for the Design of Flat Foundations and/or the Standards for the Design of Pilot Foundations.
3. Reduce the presence of ancillary structures on the site by avoiding fencing, reducing access roads and undergrounding power cables;
4. Provide uniform turbine size and design (e.g. direction of rotation, turbine and tower type, height);
5. Develop and implement a reclamation design tailored to the specific conditions and proposed measures to maximise the retention of vegetation cover.

The responsibility for the implementation of the above measures lies with the client. The measures will be supervised by the National Construction Control Directorate (NCCD), the Municipal Construction Department, the project coordinating and approving bodies and the persons exercising technical control and construction supervision.

- **Measures relating to the construction of the site**

1. Construction shall be carried out on the basis of a Health and Safety Plan (HSP) prepared by the Contractor and approved by the competent authorities, including mandatory measures for environmental protection during the construction period;
2. Installation of chemical toilets on site.
3. Separation of the humus layer from the areas to be developed and from the temporary storage areas for the excavated soil prior to the start of construction activities.
4. Developing a contingency plan that takes into account the impact of natural disasters on the environment and human health and provides for appropriate measures to mitigate them.
5. Backfill the foundations and underground cable routes with excavated earth.
6. Work on a narrow front in the excavations for the cable routes. Immediately after backfilling, carry out reclamation where possible.
7. Implement timely erosion control measures after excavation.
8. Precise demarcation of construction sites and access roads (temporary roads) for the movement of transport equipment and mechanisation, in order to protect the existing vegetation cover in the vicinity as much as possible.
9. Permanent supervision by the competent authority during the construction of temporary roads and during construction.
10. Do not allow the removal of landscape features (plane trees, single trees and groups of trees, protective forest belts) in agricultural areas.
11. Incorporate the necessary construction materials directly into the process of the relevant works to minimise temporary storage areas.
12. Do not use chemical treatments on roads.

Responsibility for the implementation of the measures shall lie with the Client and the persons exercising construction supervision. The measures shall be supervised by the National Construction Control Directorate (NCCD), the Construction Department of the municipality, the Regional Inspectorate for Environment and Water (RIEW-Varna) and the Regional Health Inspectorate-Dobrich.

- **Measures relating to the operation of the wind farm**

1. Conclusion of a maintenance contract for the wind turbines only with a company that has a permit under the Waste Management Act.
2. Periodically monitor the condition of the wind turbine foundations (cracks, uneven settlement and deformation, buckling) and check for leaks and loose wind turbine parts.
3. Shutdown of turbines when significant concentrations of birds are detected or during certain times of the year known to be peak migration periods for relevant endangered species.
4. The introduction of plant species alien to the region shall not be allowed.
5. Take measures to prevent the introduction of ruderal species into the area of the proposed investment. In order to prevent ruderalisation of the site and the wider area, it is essential that preventive measures are taken at the design stage of the investment proposal.
6. The individual installations should be placed at a distance from each other, in accordance with the attached situational layout of the wind towers, in order to make it easier for birds to avoid them.

The responsibility for the implementation of the measures lies with the client and the persons responsible for the maintenance of the facilities. The measures will be monitored by the municipality, RIEW-Varna and RHI-Dobrich.