RUISI WIND POWER PLANT PROJECT

Environmental and Social Impact Assessment

Volume 2 - Annexes

Project Implementer:
JSC Wind Power

Prepared by:
WEG Envi Consulting LLC

2023

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Director:
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Table of Contents

Annex 1. Geological Survey Report

Geoengineering LTD.

Engineering survey and design

Preliminary study of the engineering-geological conditions of Ruisi Wind Farm project area

Preliminary Report

Tbilisi

2022

Geoengineering Ltd.

Engineering survey and design

Preliminary study of the engineering-geological conditions of Ruisi Wind Farm project area

Preliminary Report

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Head of the Engineering-Geological Investigation Sector: **D. Sirbiladze**

Tbilisi

Georgia

2022

W o r d i n g

Contents

Graphics

Drawing name	Drawing no	Number of sheets
Engineeing-geological map, scale 1:25 000	GC-2231-1	1

Annexes

Annex #	Annex name	Number of sheets
1	Photos	8
2	Terms of Reference	1

1. Introduction

The present technical report gievs the results of the “Preliminary study of the engineering-geological conditions of Ruisi Wind Farm project area”. The study area is approximately 1000 ha adjacent village Ruisi (Kareli Municipality) (Fig. 1.1.). 58 tower-turbines for the wind power plant with the capacity of 206 MW are planned to install within the study area (Fig. 1.2.). The present technical report was prepared in accordance with the requirements of Contract №GC-2231 of 20.06.2022 concluded between by JSC “Wind Energy” (Client) and “Geoengineering” Ltd. (Contractor).

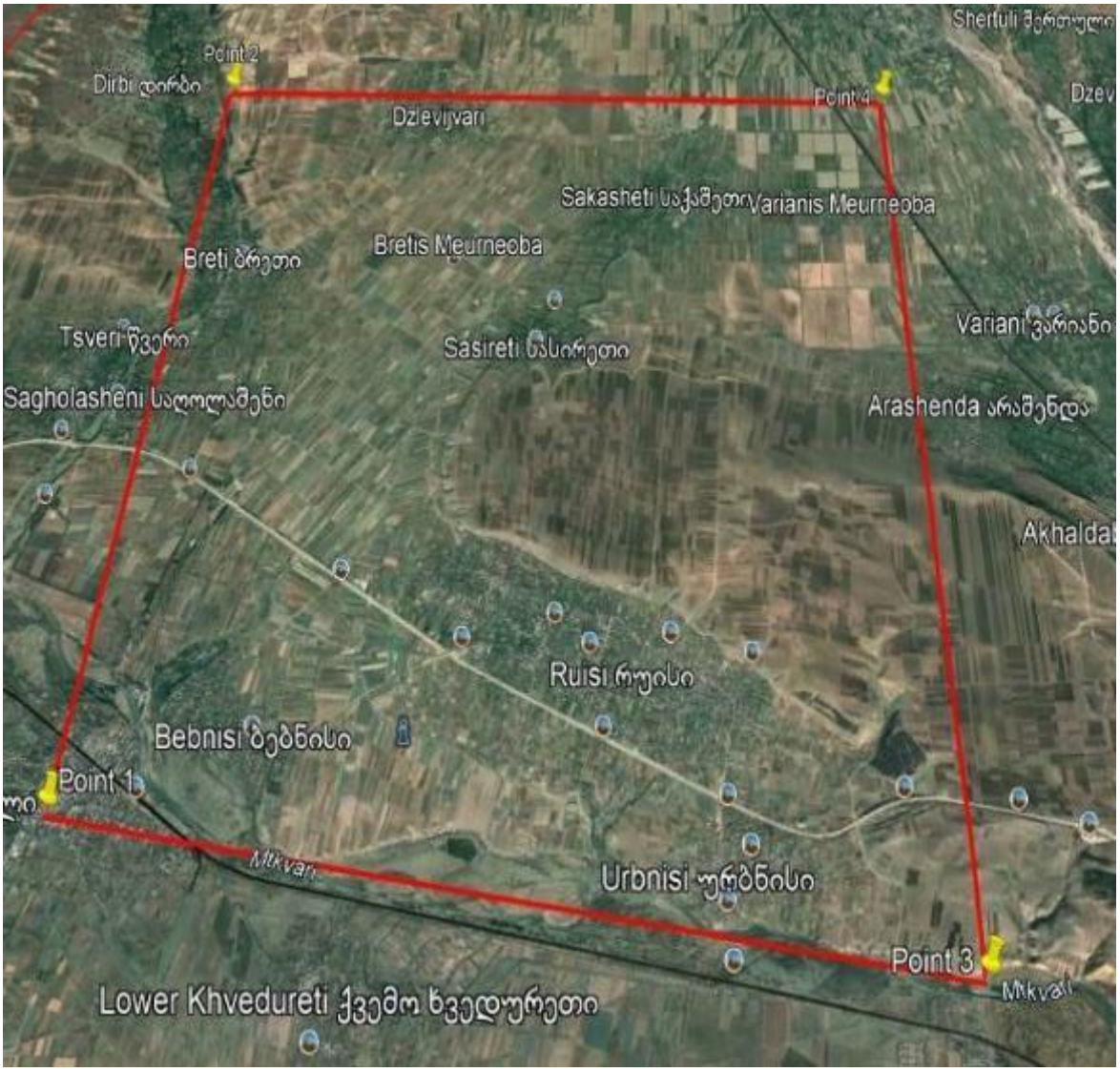

Fig. 1.1. Borders of the project area

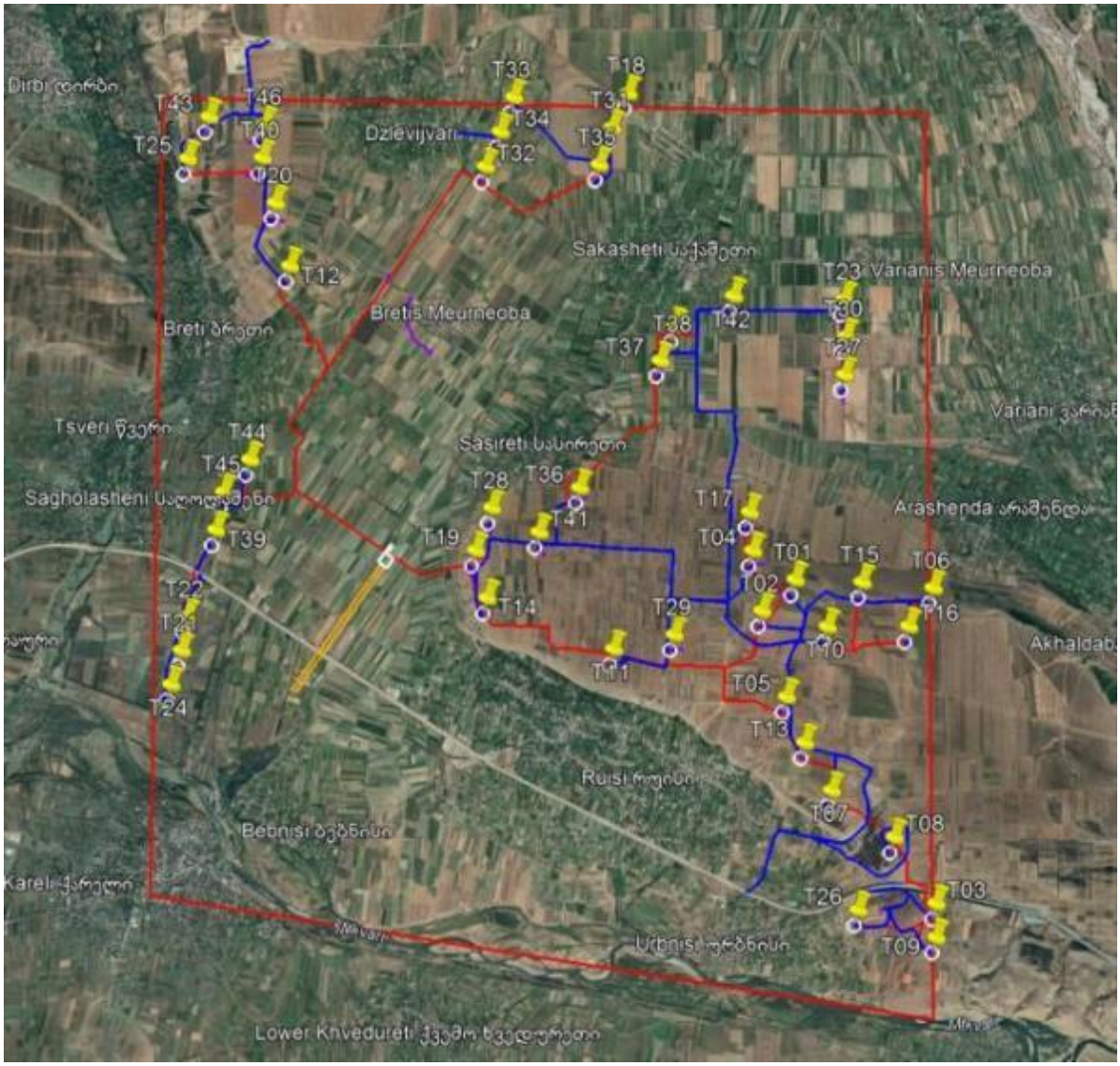

Fig. 1.2. Plan of location of the turbines of the design Ruisi Wind Farm

In accordance with the terms of reference specified by the Client, the following works were accomplished within the scope of the research program developed by “Geoengineering” Ltd.:

1. Obtaining, systematization and analysis of the available physical-geographical, geological, engineering-hydrogeological fund and literary materials regarding the project area;
2. Engineering-geological and hydrogeological reconnaissance of the project area to compile 1:25,000 map;
3. Compilation of TOR to be presented as graphics and text, based on the information obtained following the desk and field reconnaissance works;
4. The graphics of the TOR will contain:
   - Schematic engineering-geological and hydrogeological map of the project area scaled 1:25 000;
   - Photos of the areas of the engineering-geodynamic concern and dangerous events.
5. The wording of the TOR will have the following structure:

   - Introduction: purpose of the study, objectives and a general list of work performed;

- General description of the natural environment of the study area: geographical location, climatic, geomorphological and hydrogeological conditions, geological structure, tectonics and seismicity;
- Preliminary engineering and petrological description and evaluation of the locations of the wind turbine towers and access roads;
- General hydro-geological decsription of the project area;
- Preliminary assessment of the engineering and geodynamic conditions of the project area;

6. Conclusions, recommendations and program of engineering and geological surveys needed for the detailed design.

Office and field reconnaissance works needed for the above program were accomplished from June 20, 2022 to July 19, 2022.

2. Degree of exploration of the geological and engineering-geological conditions of the study area

The study area is well studied from the regional geological and engineering-geological point of view. The first geological studies began in the middle of the nineteenth century, in the whole of Georgia by G.V. Abikh (1858-1887), G. Tsulukidze (1881), S.K. Simonovich (1878-1892), S.V. Obruchev (1895), etc.

Since the 1920s when Georgian school of geology started to form, the works by I. Janelidze, I. Kacharava, P. Gamkrelidze, G. Dzotsenidze and others became popular. The scientists began to identify and specify the stratigraphic and tectonic structure of the region based on these works. The first surveys scaled 1:200 000 and 1:100 000 also started in the same period (B.F. Mepert, P. Gamkrelidze) are also carried out.

In the post-war period, the development of the geological works in the study region was renewed vigorously. A new generation of geologists appeared on the scene at the same time, speaking through their works. They were: A. Janelidze, I. Buachidze, P. Gamkrelidze, G. Dzotsenidze, I. Kacharava, A. Tsagareli, A.G. Laliyev, G. Zaridze, D. Buleyishvili, A. Javakhishvili, etc.

The beginning of broadening the geological studies started as early as the 1960s is noteworthy. During this period, the first medium-scale (1:50,000 and 1:25,000) survey works of the study area were carried out under the leadership of A. Kandelaki, Avalishvili, D.I. Papava, I.G. Vashakidze and others.

The works of fundamental research were enriched and refined based on the rich material obtained on the basis of the mentioned studies, and the nomenclature maps of Khashuri, Tskhinvali and Tbilisi were modified. This period was also marked by the compilation of geomorphological, tectonic and hydro-geological maps, which are given in the works by S. Adamia, I. Gamkrelidze, N. Skhirtladze, T. Chikhladze, D. Tsereteli and others. Collective works by Georgian geologists were published: “Geology of Georgia” Vol. X, “Hydrogeology of the USSR” Vol. X, “Geomorphology of Georgia”, “Engineering Geology of the USSR” Vol. X.

During this period, important works were carried out in terms of geophysical study which almost completely covered Shida Kartli depression.

The degree of the engineering-geological study of the study area and relevant information can be found in the above-mentioned works: “Geology of Georgia” Vol. X, “Hydrogeology of the USSR” Vol. X, “Geomorphology of Georgia”, “Engineering Geology of the USSR” Vol. X, as well the studies conducted by A. Tsagurishvili, G. Lomtadze, et al. The research was carried out: “Report of the Karelian survey party on the results of special 1:25,000 survey of the left bank of the Mtkvari River valley between the village of Kvishkheti and the Didi Liakhvi River”. 1985-1990.

The survey works of the engineering-geological party from village Java under the leadership of Tsereteli in 1969-70 is worth mentioning.

Special engineering-geological studies, the main purpose of which was to study dangerous geological processes and phenomena, were commonly conducted in the study area in the 1970-80s. Theer are many maps of hazards compiled on their basis. The studies conducted by E. Tsereteli and G. Lomtadze are worthwhile.

At the same time, it should be noted that in recent years, there are engineering facilities of various types and purposes having been built in the study area and corresponding design and survey works have been carried out. Construction of the S1 highway and rehabilitation works of the irrigation systems should be distinguished among them.

All the above-mentioned works have given quite rich information archived in at the Geological Fund of Georgia.

The technical report of geotechnical survey developed by our company in 2015 is of particular value from an engineering and geological point of view for the design wind farms in the vicinity of the city of Gori, which are located about 0.5-1.0 km southeast of the study area.

3. General description of the natural conditions of the study area

3.1 Geographical location

The study area is a part of Kareli municipality. It is located on Tiriponi Valley of Shida Kartli, on the left bank of the Mtkvari River. It is 7 km from the administrative center of Kareli. The East-West International Highway (E60) of Georgia runs in close proximity to the project area in the south.

3.2 Climatic Conditions

The climatic data of the study area were taken from Gori weather station, with coordinates: 4200' latitude and 4407 longitude, at an altitude of 602.0 m above sea level, occupying a plain and foothill zone of East Georgia.

In terms of building and climatic zoning, the study area is a hot sub-region of moderately humid region of East Georgia with average air temperatures ranging from +21-26 to -1+2°C, with average relative humidity of 55-75% in the hottest month, average wind speeds ranging from 0.5 to 4.2 m/s in the hottest month and from 0.4 to 4.0 m/s in the coldest month. In terms of building and climatic zoning, the study area is classified as IIb.

According to the data published by the Hydrometeorological Center of Georgia, the climatic conditions in the study area are as follows:

Average annual air temperature in the area is 10.8°C. The coldest month is January with average temperature of -4.1°C, with many frosty days; the absolute minimum is -26.1°C. The warmest month of the year are July and August, with an absolute maximum of 37.0°C.

Table #3.1

Average annual nd monthly air temperature, °C												
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Average annual
-0.7	0.7	5.2	11.1	15.4	18.9	21.8	21.4	17.5	11.5	5.8	1.3	10.8

Table #3.2

Average minimum air temperature in different months, °C												
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Average annual minimum
-4.1	-3.3	0.5	5.2	9.7	13.4	16.7	16.3	12.3	6.8	1.4	-2.3	6.1

Table #3.3

Absolute minimum of air temperature in different months, °C												
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Absolute annual minimum
-26.1	-23.5	-15.1	-8.6	-2.3	3.4	6.7	5.1	-0.8	-4.9	-17.5	-20.1	-26.1

Table #3.4

Average maximum air temperature in different months, °C												
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Absolute annual maximum
4.1	5.8	11.3	17.8	21.9	25.4	28.1	27.6	23.9	17.8	11.4	6.0	16.8

Table #3.5

Absolute maximum of air temperature in different months, °C												
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Absolute annual maximu
16.0	21.5	25.4	28.4	30.8	36.2	37.0	36.5	33.8	26.8	24.0	20.6	37.0

Maximum relative air humidity in hot and cold months is 67% and 81.9%, respectively.

Table #3.6

Average monthly and annual relative air humidity, %,												
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Average annual
80.3	77.5	70.9	67.0	69.4	69.4	68.5	67.4	71.1	75.6	80.3	81.9	73.3

The annual amount of precipitation in the area is 521.8 mm. Their maximum falls in June 63.1 mm, and the minimum amount falls in January 32.6 mm. The average daily maximums of precipitation in different months are given in the tables below.

Table 3.7

Average amount of atmospheric precipitations, mm												
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
32.6	30.5	32.3	49.5	60.2	63.1	47.5	42.1	33.9	44.9	46.3	38.9	521,8

Table 3.8

Number of days with different amounts of precipitations (days)								
Month	>0,1	>0,5	>1	>5	>10	>20	>30	>50
I	10.6	8.5	I 7.1	1.9	0.7	0.1	0.0	0.0
II	8.9	7.5	6.1	1.9	0.6	0.1	0.0	0.0
III	9.1	7.9	6.4	2.2	0.7	0.1	0.0	0.0
IV	10.6	9.4	8.0	3.3	1.2	0.4	0.1	0.0
V	13.4	11.9	10.1	4.4	1.6	0.2	0.0	0.0
VI	11.9	10.7	9.1	4.0	1.8	0.4	0.2	0.0
VII	8.3	7.4	6.0	2.5	1.4	0.6	0.2	0.0
VIII	7.2	6.0	5.0	2.4	1.4	0.4	0.1	0.0
IX	8.2	6.9	5.4	2.2	0.9	0.2	0.0	0.0
X	9.5	8.6	6.9	2.4	1.3	0.4	0.1	0.0
XI	9.5	8.3	7.4	2.9	1.3	0.3	0.1	0.0
XII	10.7	9.0	7.3	2.6	1.0	0.2	0.0	0.0
Annual	117.9	102.1	84.8	32.7	13.9	3.4	0.8	0.1

Table 3.9

Average decade height of snow cover, cm										
Decade	Mont									
	IX	X	XI	XII	I	II	III	IV	V	VI
I			*	1	3	6	*			
II			*	*	4	5	*			
III			*	3	6	1	*			

Table 3.10

Maximum decade height of snow cover, cm				
Of the greatest decade height	Maximum of decades	Minimum of decades	Daily maximum	Date
12	45	1	63	03.02.1988

Table 3.11

Number of days with snow cover in different decades										
Decade	Mont									
	IX	X	XI	XII	I	II	III	IV	V	VI
I			*	1	3	5	*			
II			*	1	4	4	*			
III			*	3	5	2	*			

Table 3.12

Snow load characteristics, Table #3.12			
Water content of snow cover, mm	Maximum water content of snow cover, mm	Weight of snow cover (possible once in 50 years), KPa	Weight of snow cover (possible once in 25 years), KPa
31	111	1.05	0.85

The prevailing wind direction is predominantly northeastern and southeastern, with recurrence probability of 29.4 and 35.8. Their maximum speed reaches 3.4 m/s in March and April. Rated wind pressure values reach 0.30 kPa in every 5 years and 0.38 kPa in every 15 years (according to Building Climatology).

Average monthly and annual wind speeds are given in Table 3.13.

Table 3.13

Average monthly and annual wind speeds, m/s												
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Annual
2.3	2.7	3.4	3.2	2.9	2.8	2.9	2.8	2.6	2.2	1.7	1.8	2.6

Table 3.14

Wind direction and still reoccurrence, %								
N	NE	E	SE	S	SE	E	nE	Still
1.7	1.0	9.0	35.8	4.5	4.4	14.2	29.4	47.9

Table 3.15

Rated wind velocity, m/s							
Possible maximum wind velocity once in 1, 2, 5, 10, 15, 20, 50 and 100 years							
18	26	29	32	33	34	36	38

Table 3.16

	Rated ground freezing depth, cm		
Clay and loam	Fine and dusty sadn and sandy loam	Coarse and medium gravely sand	Coarse
19	23	25	28

3.3 Hydrographic network

The hydrographic network of the study area is connected to the Caspian basin. It is mainly fed by surface runoff from rain and snowmelt, and consequently, the water level fluctuates and changes rapidly during the day. Fluctuations in the levels are more unchanged in autumn and winter. Small rivers and tributaries are practically deprived of permanent water flow.

The main river of the study area is the Mtkvari; however, smaller rivers: the West, East, and Middle Frone are no less important.

3.4 Vegetation cover and soils

The project area has mild, flat terrain, with hilly section in some areas only. Soils are mainly presented by anthropogenic landscapes, with brown, carbonate, medium thickness and stony loam texture.

Cultural plants in the study area are represented by the plots with wheat, corn, garlic, potatoes, alfalfa and wind-breaking belts (with ruderal and field plants developed in the undergrowth). Pastures, which are mostly weeded and degraded, also occupy wide araes. Thus, it can be said that most of the study area is covered by secondary anthropogenic vegetation. Primary vegetation is developed over small areas and is presented by dry forest fragments, oriental hornbeam (Carpinus orientalis). Certain areas are also occupied by secondary vegetation as steppes, and groups of bushes of Jerusalem Thorn (paliurus spina cristii), rhamnus (Rhamnus pallasii) and hawthorn (Craetegus pentagyna). Such sections are originated on te sites of former forests.

Natural secondary vegetation is presented mainly by the steppes and bushes of Jerusalem Thorn and hawthorn. The steppes (including pastures) are developed over quite great areas and represent the structures with both, monodominant and polydominant composition.

It can be said that the diversity of vegetation in the study area and its structural distribution coincide with the regularities of Shida Kartli geobotanical zone, although it is characterized by strong synanthropization and degradation.

3.5 Geomorphological conditions

The study area is a plain region of Shida Kartli, with 4 sub-areas to distinguish depending on geomorphological properties:

1. Low and medium hilly, intensely fragmented erosion-denudation relief spread on the Tertiary substrate.

2. Low-hilly Ruisi massif, dissected due to denudation-erosion processes, formed on the Molassa substrate of the Miocene-Pliocene age.

3. Tiriponi-Saltvini accumulative plain with a slight southern slope.

4. Slightly sloping terrace-accumulative relief stretching over the alluvial-proluvial deposits of the Mtkvari River and its tributaries.

4 Geological, hydrogeological and seismic conditions of the study area

4.1 Tectonics, Stratigraphy, and Lithology

According to the tectonic zoning map of Georgia, the study area is a part of Mukhrani-Tiriponi subzone of the eastern subsidence of the Georgian Block. A syncline depression of the river East Prone and vault-shaped anticline elevation of Miocene-Pliocene rocks with the outcrop of mountain Malkhazis Tsveri near village Ruisi can be identified immediately in the study area.

The site along the left bank of the Mtkvari River, near the village of Urbani, where Upper Eocene rocks overthrust on Upper Cretaceous rocks is noteworthy. At this location, the incidence of the angle of fracture plane to the northeast is 60-65 degrees. The geological structure of the study area is mainly represented by marine molasse deposits of the Middle Miocene and Sarmatian ages: clays, sandstones, conglomerates, andwith marls and limestones at some locations.

4.2 Hydrogeological conditions

According to the hydrogeological zoning of Georgia, the study area belongs to Kartli sub-zone of porous-fissure and fissure-karst waters being a part of the artesian basin of the Georgian Block, which is represented by aranaceous sandy and shingle rocks building the marine and river terraces of Postpliocene age what plays an important role in identifying the engineering and geological conditions. Among them, karst waters and groundwaters of alluvial and alluvial-marine sediments, which are often hydrodynamically connected to the underlying artesian horizons, are identified (Fig. 4.1.).

Porous and porous-fissure waters with shallow circulation are water-abundant. They receive considerable amounts of atmospheric precipitations and they drain at the level of the local erosion base as fairly big springs and karst rivers. Due to this, powerful underground streams of the Mtkvari river are formed within Tiriponi Valley. Particularly important are the resources of underground waters of old riverbeds. The natural groundwater resources of Kartli artesian basin, calculated with a hydrograph, are 24.4 m3/day.

Three (III, IV and V) of the conditionally identified 7 sites (see Fig. 5.1) in the area deserve special attention from the hydrogeological point of view, where groundwaters may outcrop at the depths of 1-3 and 3-6 m. In other four sites (I, II, VI and VII) groundwater is not expected to outcrop in the foundations of the project tower-turbines.

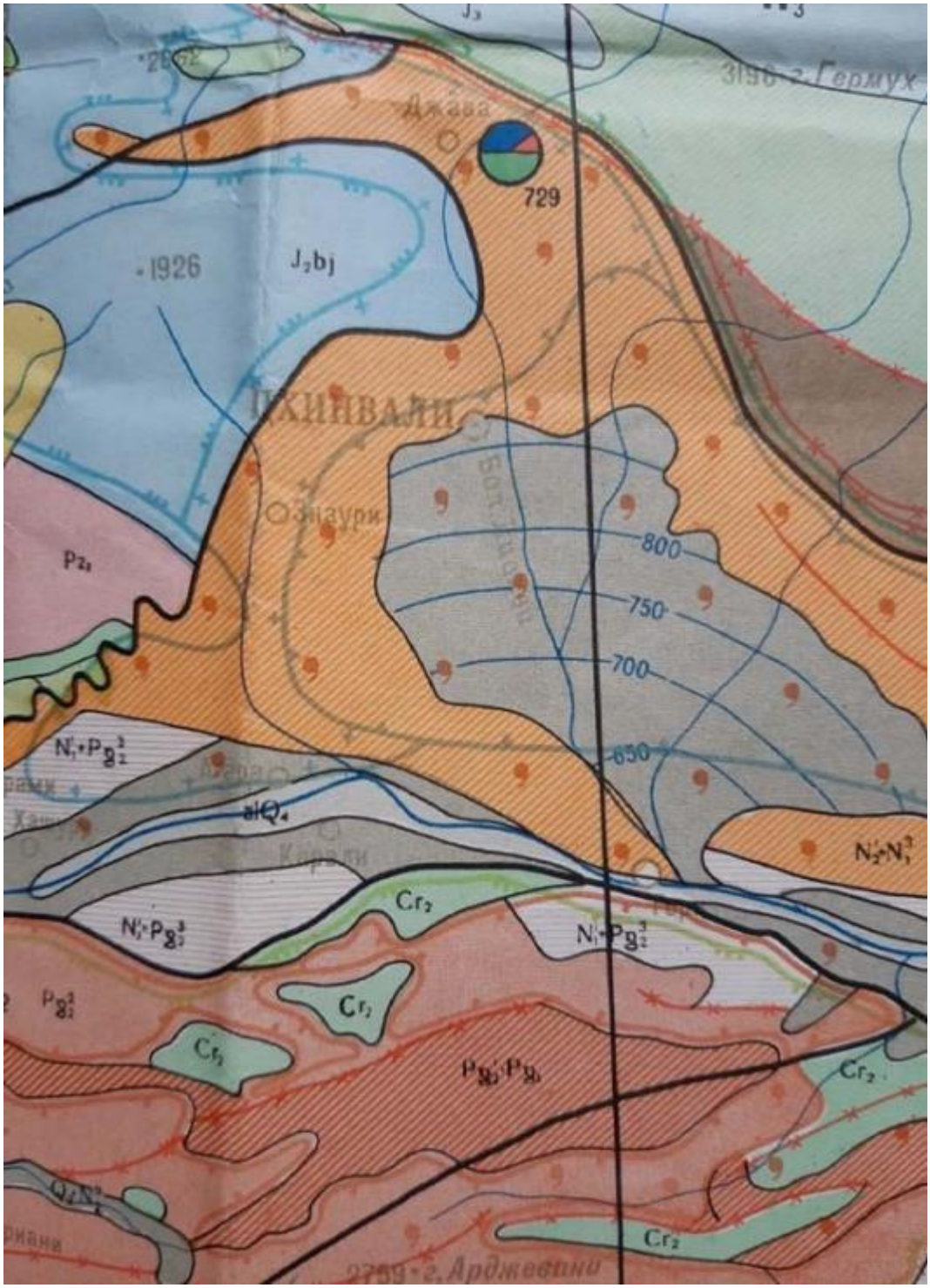

Fig. 4.1. Hydrogeological map

4.3 Seismic Conditions

According to PN 01.01.09 (“Seismic Construction”), Kareli Municipality mainly belongs to the 8-point seismicity zone. According to the macroseismic intensity map of Georgia (see Fig. 4.2.), all 7 districts of the study area have similar seismic conditions.

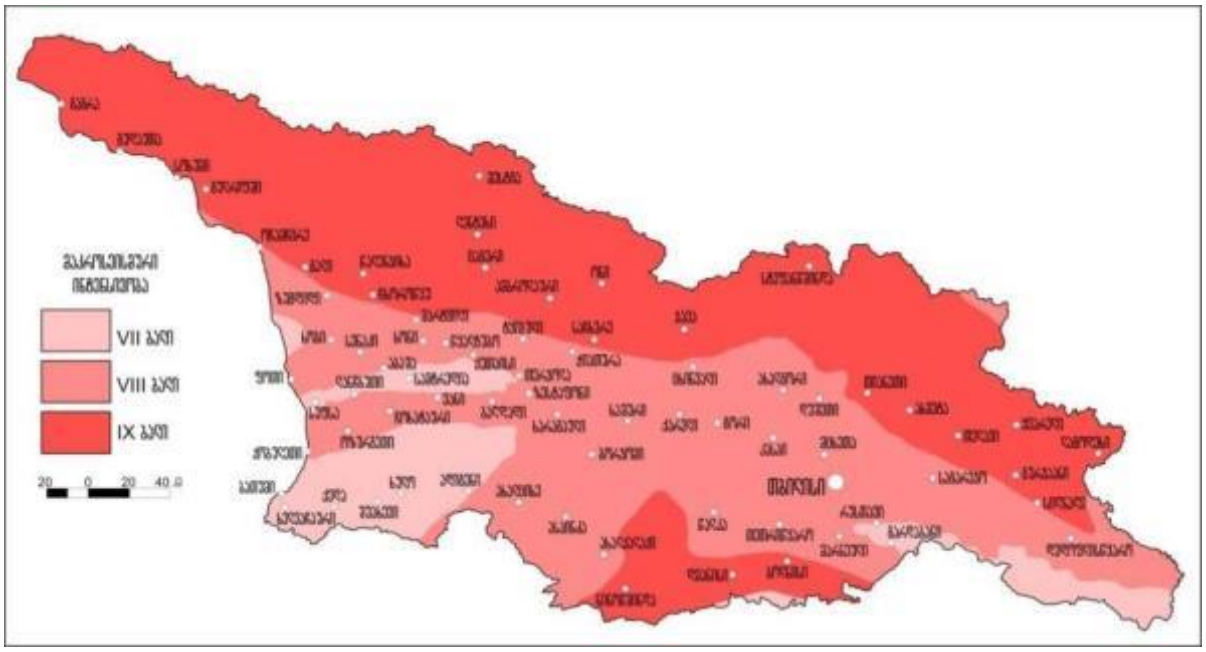

Fig.4.2. Macroseismic intensity map of Georgia

Table #4.1 below gives the seismic data of administrative units of Kareli municipality, within the PTL area:

Table 4.1

Municipality	Village	A – dimensionless seismicity ratio	Points (MSK 64 scale)
Kareli	Ruisi	0,20	8
	Urbnisi	0,21	8
	Bebnisi	0,20	8

5 General decsription of engineering and geological conditions

According to the Engineering and Geological Zoning of Georgia suggested by Professor Ioseb Buachidze, the study area is a part of Khashuri-Zemo Avchala subregion (VI22)of aranaceous sandy and shingle and plastic rocks of the Mtkvari river plains of the eastern subsidence of the Georgian Block, presented by gravelly sandy loam and sandy aggregate. In general, the engineering-geological conditions of the study area are of medium complexity, and according to SNiP 1.02.07-87 it belongs to the II category.

5.1 Engineering and petrological characteristics

The rocks within the study area are divided into two main groups as the fund materials suggest: the basement and the cover rocks. The basement rocks are presented by hard and semi-hard rocks, while the cover rocks are both loosely-unbounded and weakly-bounded rocks. Therefore, the rocks in the study area can be divided into the following groups and subgroups: the group of hard and semi-hard rocks includes molasse sediments of the Lower Miocene age: clays, sandstones, conglomerates, limestones, and marls. The group of cover rocks can be divided into two subgroups: a subgroup of loosely-unbounded and soft-bounded rocks. The former incorporates the rocks of alluvial and alluvial-proluvial genesis presented by gravel and shingle with gravel and sand aggregates accumulated in the riverbeds and old terraces: aQIII-IV and apQIV. The subgroup of weakly-bounded rocks includes mainly slope rocks: of eluvial-deluvial (edQIV), coluvial-deluvial (cdQIV) and deluvial-proluvial rocks genesis (dpQIV).

Based on the study of basic engineering-geological materials and engineering-geological reconnaissance of the study area, company “Geoengineering” has developed a schematic engineering-geological map of the said area scaled 1:25000 (Figure GC-22-31-1).

According to the effective Georgian soil standard GOST 25 100-82, there are three groups of grounds in the study area: artificial, uncemented sediment and cemented sediment.

The grounds of the artificial group include loams and sandy loams containing construction material waste and household garbage.

The uncemented sedimentary group is presented by soils of two subgroups:

1. Coarse-grain
2. Dusty and clayee

First - the subgroup of coarse-grained soils includes 5 types of soils, which differ from each other with their stratigraphic, genetic and lithological properties.

Second – the subgroup of dusty and clayey soils is presented by two types of lithostratigraphically and genetically different clayey soils.

The group of cemented sedimentary rocks includes one subgroup of semi-hard rocks, which is presented by 4 lithostratigraphic rock complexes.

The araes of distribution of each type of the above-mentioned grounds and their descriptions are given in the accompanying schematic engineering and geologic map (see Fig. C-2231-1)

The tower-turbines of Ruisi Wind Farm, depending on their geomorphological properties and the characteristic of their engineering and petrological conditions, can be conditionally divided into 7 sites. The engineering and petrological description of these sites is given below.

Site I with the design tower-turbines: T05, T18, T07, T08, T20, T12, T23, T03, T02, T25, and T16 (see Appendix 1, photos 2, 4, 6, 7, 8) geomorphologically belongs to Ruisi low mountain range developed on Miocene Meotian-Pontic substrate. It is a plateau dissected with hilly watershed and erosion dry gullies, which gradually rises from south to north and reaches the maximum height near so-called Malhazistsveri Mountain. The relative height of the hills ranges from 30-35m and reaches 65-75m only rarely. On the southern hill of this site, 10-12 m from its top, an artificial pine forest is planted on the slope. The pines are 7-15 m high and 25-49 cm in diameter. The ground surface is mostly turfed and stable. T05, T18, T08, T03, T23 and T02 turbine towers are supposed to install on the hypsometrically

higher points of the hilly hillock watershed in the given area. T12 and T20 turbine-towers are planned to construct on the eastern slope of Malkhasistviri Mountain, while remaining T25 and T16 turbine-towers are planned to constuct on the inclined northern slope of the same mountain. The geology for the construction of the project tower-turbines on the I site is presented by two types of Miocene-Meotic-Pontic Stage and Quaternary rocks. The Miocene rocks are lithologically represented by slightly cemented medium and coarse-grain conglomerates, with interlayers and streaks of sandstones, argillite-like clays and loams. Their strength is hundreds of meters. 3-5 to 7-10 m above the ground surface, the above semi-hard rocks are covered by eluvial dry and low-moist shingle and gravel of the Quaternary age with loamy aggregates, with hard and semi-hard loams at some places originated due to the weathering of the said rocks. No goundwater exposure is expected in the foundation base of the design turbine-towers.

Site II with design tower-turbines T35, T17, T16, T19, T44, T38 and T56 (see Appendix 1, photo 10) geomorphologically represents a part of Tiriponi-Saltvini accumulative plain with a slight southern and southwestern slope. In view of engineering and petrology, this site is homogeneous as compared to the I site and is represented by slightly cemented medium and coarse-grained conglomerates of the Neogene Meotic and Pontic stages, with the interlayers and streaks of sandstones, argillite-like clays and loams. These rocks are covered by the Quaternary eluvial-deluvial clays and loams containing pebbles and gravel. Their consistency is most likely hard, semi-hard and rigid-plastic at little depths; their strength must be 7-10 m at some locations.

Geomorphologically, the III site with design tower-turbines T27, T34, T58, T46, T48, T33, T29, T55, T37, T30, T56, T13, T21, T28, T52 (see Appendix 1, photo 9) is a part of the right over-floodplain terrace of the Didi Liakhvi river. It is built with marine molasse formations of the Sarmatian age and overlying Holocene alluvial-proluvial sediments, which are represented by coarsely processed shingle and interlayers of sand-and-gravel with loam interlayers. From the depth of 1-3 m from the surface, these sediments are intrused with fresh ground waters.

Presumably, their strength does not exceed 7-9 m. The bedrocks of Sarmatian age underlying the alluvial-proluvial grounds are lithologically represented by sandstones, argillite-like clays, and conglomerates at some places. Their strength is several hundreds of meters. They belong to the subgroup of semi-hard rocks.

Geomorphologically, the IV site with design tower-turbines T11, T24, T41, T53, T49, T42 and T22 (see Appendix 1, Photos 11, 12) is a part of the left flattened hilly ridge of the river East Proneof Tiriponi-Saltvini accumulation plain. The geological structure of this area is presented by the sandstones of Sarmatian age, argillite-like clays, and conglomerates at some locations, which are covered by deluvial-proluvial and eluvial formations. Deluvial-proluvial deposits cover the given main rocks of Sarmat age on the slightly sloping eastern gradient of the hilly ridge. They are presented by clays, loams and sands with the inclusions of

pebbles, gravel and grit. The groundwater level in these sediments should probably be within the range of 3-6m. As for the eluvial grounds, they are common over the flattened and plateau-like very slightly sloping gradients of the hilly ridge. The strength of the Quaternary deluvial-proluvial and eluvial grounds in this area is presumably 5-7 to 9-10 m.

Geomorphologically, the V site with design tower-turbines T36, T32, T26, T15, T10 and T57 (see Appendix 1, Photos 13, 14) is the left over-floodplain terrace of the river East Prone. The geological structure of this area is presented by Sarmat sandstones, argillite-like clays and conglomerates and Holocene coarsely processed Holocene alluvial-proluvial shingle and grit and gravel with loam interlayers the at some locations deposited on them, with clays and loams with the thickness of approximately 3 m. The ground water level must be 1-3 to 4-5 m.

The VI site with the design tower-turbine T06 (see Appendix 1, Photos 1, 3, 4, 5) is an oval hill with a relative height of 30-35 m. It is built with slightly cemented, medium- and coarse-grained conglomerates of Meotic-Pontic age, with the interlayers and streaks of sandstones, argillite-like clays and loams. These rocks are covered by Quaternary eluvion and shingle and gravel with loam aggregate. Clays are semi-hard and hard in consistency. The maximum thickness of eluvial grounds is presumably 5-7 m.

Site VII with projects of turbine towers T01, T04 and T09 (see Appendix 1, photos 15, 16) is a hilly ridge, with its geological structure presented by sandstones, argillite-like clays and conglomerates of Sarmatian age, covered by Quaternary eluvial shingle and gravel with loamy aggregate. Loams are dry or slightly moist, so their consistency ranges from hard to semi-hard. The presumable strength of these grounds does not exceed 5-7m.

5.2 Engineering-geodynamic state

In terms of the development of geological processes and events, no significant threats are fixed in the study area. The rocks forming the slopes are mostly in a stable state. Their development is mainly expected on the deeply cut river slopes as erosion processes and related landslide phenomena, mainly in the erosion valleys of the Mtkvari River and its tributaries (see engineering-geological map Fig. GC-2231-1.). Therefore, the study of landslide phenomena in the study area involves immediately studying erosion processes.

Most of such these landslides are on the left bank of the Mtkvari River, where lateral erosion develops quite intensely. Often they break off the shoreline as large clumps built with slightly bound alluvial deposits.

As for the left small tributaries of the Mtkvari River developed in molassa rocks of Miocene-Pliocene age, they totally depend on the intensity of atmospheric and surface runoff and participate in the regime of erosion processes occurring in the valleys. Therefore, they are activated with spring floods and periods of rainy weather, especially heavy rainfalls. It should be noted that the said landslide bodies are not only locally spread near the valley. Rather, they often extend and occupy adjacent areas, what is once again due to the development of erosion processes, especially lateral erosion. Erosion processes, as mentioned above, are associated with the left tributaries of the Mtkvari River. The erosion network has dense branches and covers large areas in the northern areas of Urbnisi village taking place due to easily erodible constituent rocks.

Another type of erosion to distinguish among the erosion processes occurring in the study area is plane erosion, more related to the crests and other positive relief forms in the area, especially in areas devoid of the tree and grass cover.

As for the hazardous geological processes and phenomena developed within the study area (following the project goals), attention should be paid to suffosive phenomena, which may develop in the clay-sandy rocks of Pliocene age. It should also be noted that suffosive forms are not characterized by mass distribution, although they often develop in a latent form, and it requires some effort for researchers to identify them.

In addition to the above-mentioned, we can note bogging of some areas caused by the failure of irrigation systems or improper use of the irrigation water.

There are also rock avalanches over the steep sections of high slopes, which mostly appear in the area of Pliocene conglomerates.

Landslides occupy limited areas within the study area and are mostly associated with the same valleys where landslide and erosion processes occur, although their occurrence is less dangerous and they flow into the valley bed only as small streams.

The hazardous geological processes and phenomena described above develop in places remote from the study areas (7 areas) and therefore, do not pose any threat to the construction of the design tower-turbines.

5.3 General description of the engineering-geological conditions

The comprehensive analysis of the engineering-petrological and engineering-geodynamic conditions of the study area demonstrates that the local engineering-geological conditions are neither plain, nor very complex, but of the medium complexity.

No hazardous geological processes and phenomena are fixed in the study areas (7 sites). The factor complicating the construction of the design tower-turbine is seismic phenomena related to the internal tectonic forces of the Earth – the earthquakes. All sites of the study area belong to the 8-point earthquake zone.

From the engineering-petrological point of view, the study area is of a medium complexity. Each of the conventionally allocated 7 sites has the grounds with 2 or and more layers. With further detailed studies, in accordance with the changes of their physical state and physical-mechanical properties, we should obviously expect to identify much more engineering-petrological units instead of 12 lithostratigraphic complexes identified in the attached schematic engineering-geological map (Fig. 5.1. GC-2231-1).

In view of complexity of the engineering-hydrogeological conditions I, II. VI and VII sites are plain, while III, IV and V sites are of a medium complexity.

By considering all the assessments given above, we can conclude that as per preliminary studies, the given conditions for the construction of the design tower-turbines are favorable and, with a high probability, no engineering-geological complications are expected.

6 Conclusiosn and Recommendations

The analysis and evaluation of the data of the office and field reconnaissance studies of the engineering and geological conditions of the Ruisi Wind Farm area allow drawing the following conclusions:

- According to the building and climatic zoning, the study area belongs to the IIb region and is a part of a hot sub-region of a moderately humid region of East Georgia with an average air temperature of +21-26 to -1+2°C.
- In terms of geomorphology, the area is a part of Shida Kartli Plain with low and medium-high hilly plateaus, gentle slopes and terraced accumulative relief.
- According to the tectonic zoning map of Georgia, the study area is a part of Mukhranti-Tiriponi subzone of the eastern subsidence of the Georgian Block, the geological structure of which is presented by marine molassa deposits of Neogene Meotic-Pontic, Sarmatian, Karagan-Concian and Chokrak stages - the conglomerates, sandstones, gravelites and argillite-like clays. These main rocks are covered by Quaternary aluvial, aluvial-proluvial, deluvial-proluvial, eluvial and artificial grounds.
- In a hydrogeological view, the territory belongs to Kartli subregion of porous-fissure waters, which is a part of the artesian basin of the Georgian Block. Three (III, IV and V) of the

conditionally selected 7 sites in the area deserve special attention, where groundwaters may outcrop at the depths of 1-3 and 3-6 m. In other four sites (I, II, VI and VII) groundwater is not expected to expose.

- According to the macroseismic intensity map of Georgia, all 7 sites of the study area belong to the 8-point seismic zone with a non-dimensional seismicity coefficient of 0.20-0.21.
- Depending on the geological, hydrogeological, engineering-petrological and engineering-geodynamic conditions, according to Annex 10 of Building Norms and Rules 1.02.07-87 (Engineering Surveys for Construction), with the complexity of the engineering-geological conditions, the design sites of the tower-turbines of Ruisi Wind Farm are of a medium complexity and belong to the II category.
- With further detailed studies, we should obviously expect to identify much more engineering-petrological units instead of 12 lithostratigraphic complexes identified in the attached schematic engineering-geological map (scale 1:25 000).
- The study area is characterized by plain engineering and geodynamic conditions. No hazardous geological processes and phenomena are recorded in it.
- Based on the analysis and assessment of the engineering-geological information obtained from the preliminary studies, it can be concluded that the conditions for the construction of Ruisi tower-turbines are favorable and, with a high probability, mo geological complications are expected. Obviously, this assumption needs to be appropriately confirmed in the next phase with detailed engineering and geological surveys.
- The program of engineering-geological surveys, which must be realized to develop the detailed design, must be based on the exact coordinates of the location of individual design objects of the WPP (Wind Farm) (tower-turbine, power transformer unit, access road, etc.) and static and dynamic loads transmitted from them to the grounds of the foundation base.
- The program of engineering-geological surveys necessary to develop the detailed design of Ruisi tower-turbine, power unit and access roads to them is given below (Table 6.1.). The program can be specified by agreement with the Client taking into account the above recommendations.

Table 6.1

№	Description	Unit of measurement	Number in different study sites								Total
			Site I	Site II	Site III	Site IV	Site V	Site VI	Site VII	Voltage substation	
1	**Field survey works**										
1.1	Layout of survey points (boreholes, pits, VES), identifying their coordinates and levels at the towers locations.	1 tower	11	7	15	7	6	1	3	1	**51**
1.2	Layout of survey points (boreholes, pits, VES), identifying their coordinates and levels along the access roads and cable lines.	1 point									**0**
1.3	Drilling vertical boreholes up to 10 m deep by sampling and detailed	Borehole	11	7	_	7	_	1	3		**29**
		Lin. M.	110	70	_	70	_	10	30		**290**

№	Description	Unit of measurement	Number in different study sites								Total
			Site I	Site II	Site III	Site IV	Site V	Site VI	Site VII	Voltage substation	
	engineering-geological documentation										
1.4	Drilling vertical boreholes up to 15 m deep by sampling and detailed engineering-geological documentation.	Borehole	_	_	15	_	6	_	_	1	**22**
		Lin. M.	_	_	225	_	90	_	_	15	**330**
1.5	Standard dynamic penetration test (SPT) in boreholes with 1.5 m intervals	1 Borehole	11	7	15	7	6	1	3	1	**51**
1.6	Drilling holes up to 3 m deep by sampling and detailed engineering-geological documentation on the tower-turbine grounds	1 Hole	11	7	15	7	6	1	3	1	**51**
1.7	Drilling holes up to 3 m deep by sampling and detailed engineering-geological documentation along the access roads and cable lines, with the length of 50-53 km	1 hole	30	30	32	16	10	12	5	_	**135**
1.8	Vertical electrical sounding (VES)	Pc.	37	29	46	22	17	8	9	3	**171**
2	**Laboratory works**										
2.1	Study of the physical properties of grounds	1 set	33	21	45	21	18	5	15	5	**163**
2.2	Study of the mechanical properties of grounds	1 set	33	21	45	21	18	5	15	5	**163**
2.3	Standard ground cimpaction	1 trial	11	7	15	7	6	1	3	1	**51**
2.4	Chemical analysis of grounds (pH, chlorides, sulphates)	1 analysis	22	14	30	14	12	2	6	2	**102**
2.5	Chemical analysis of ground waters (pH , content of sulphates, content of chlorides)	1 analysis			15		6			1	**22**
3	**Office works**										
3.1	Desk processing of the results of field and laboratory studies, drafting engineering-geological sections, defining the rated and estimate values of the physical and mechanical properties of grounds.	1 set	1	1	1	1	1	1	1	1	**8**
3.2	Drafting the geological-engineering report	1 report	1	1	1	1	1	1	1	1	**8**

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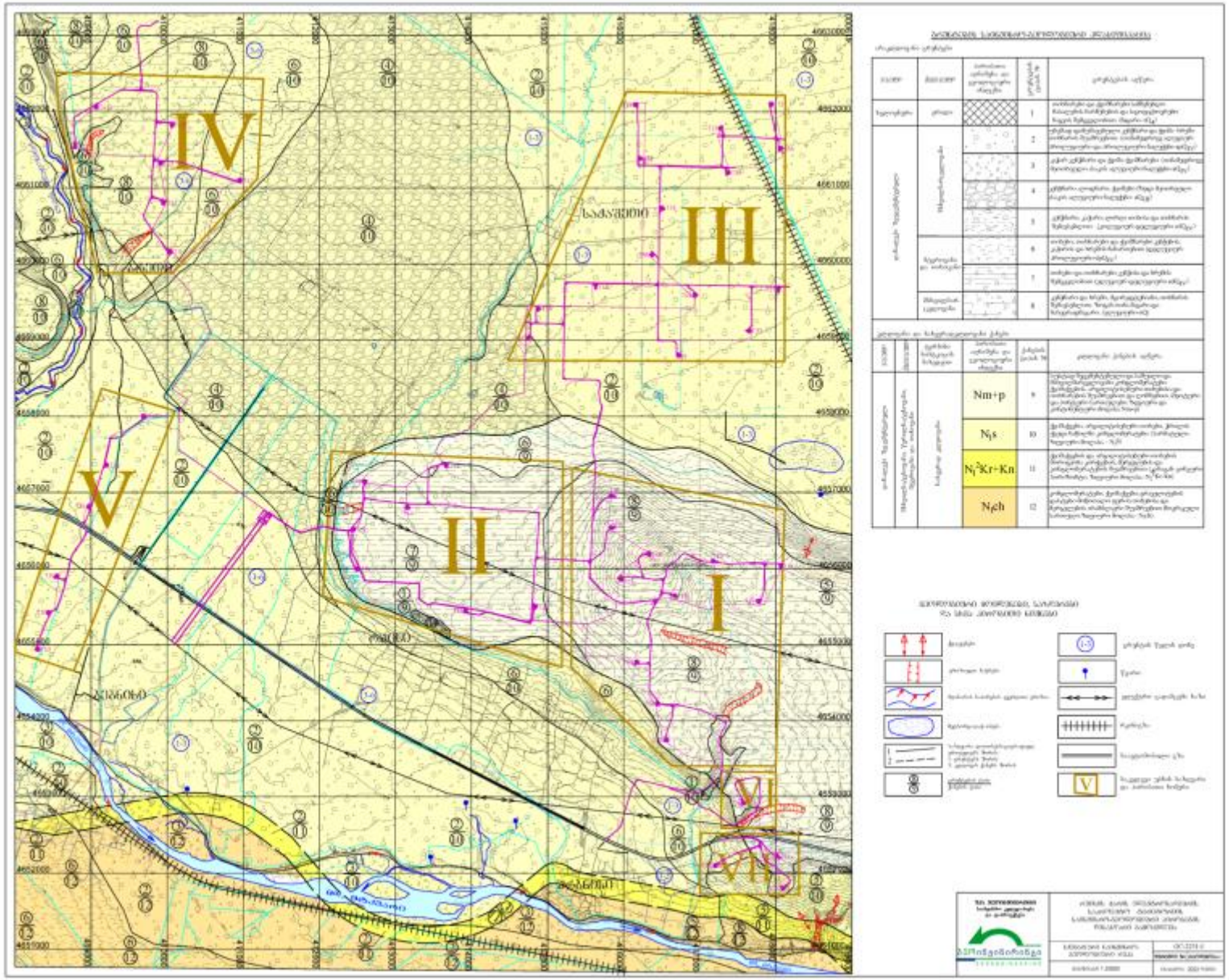
Graphics

Drawing name	Drawing no	Number of sheets
Engineeing-geological map 1:25 000	GC-2231-1	1


IV
III
V
II
I
VI
VII
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N1s
N1³Kr+Kn
N2ch

Annexes

Annex #	Description of annex	Number of sheets
1	Photos	8
2	ToR	1

Annex 1. Photos

Photos evidence (06.07.2022)

Project name: GC-2231 - Preliminary study of the engineering-geological conditions of Ruisi Wind Farm project area

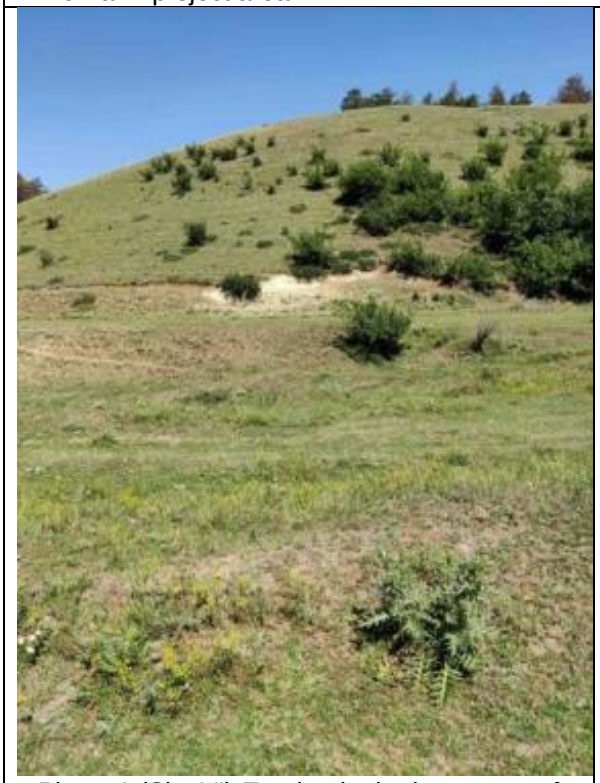


Photo 1 (Site VI) Erosion in the lower part of the southeastern slope of TO6

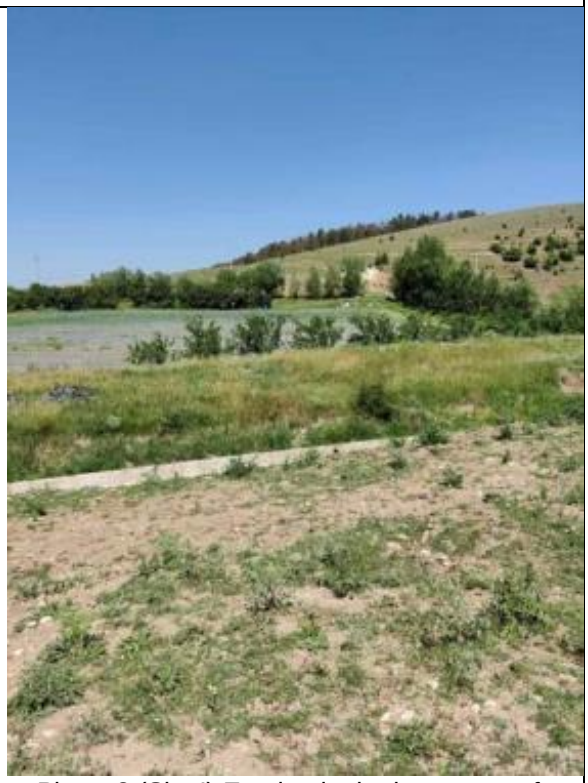


Photo 2 (Site I) Erosion in the lower part of the southeastern slope of TO5

Photos evidence (06.07.2022)

Project name: GC-2231 - Preliminary study of the engineering-geological conditions of Ruisi Wind Farm project area

Photo 3 (irrigation channel between sites I and VI)

Photo 4 Construction waste along the ground road between sites I and V I

Photos evidence (06.07.2022)

Project name: GC-2231 - Preliminary study of the engineering-geological conditions of Ruisi Wind Farm project area

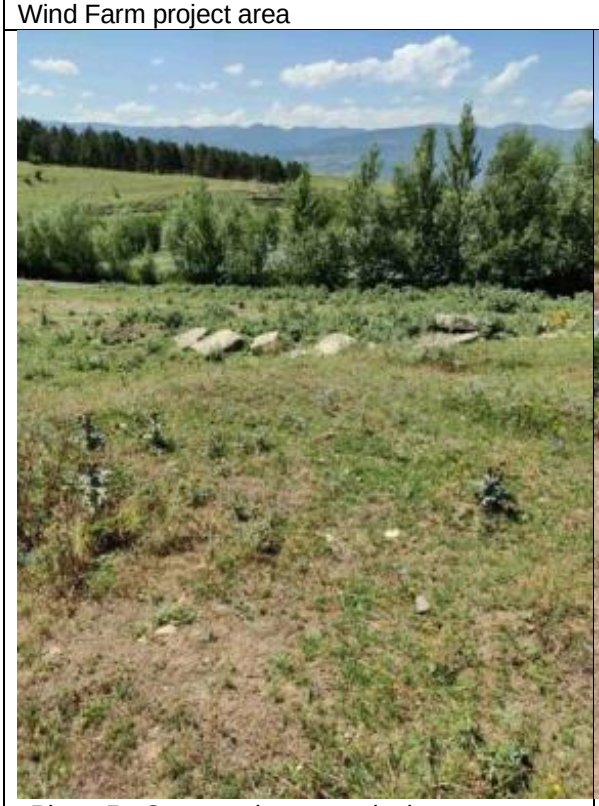


Photo 5 - Construction waste in the area between sites I and VI

Photo 6 (Site I) ground fill along the irrigation channel under construction

Photos evidence (06.07.2022)

Project name: GC-2231 - Preliminary study of the engineering-geological conditions of Ruisi Wind Farm project area

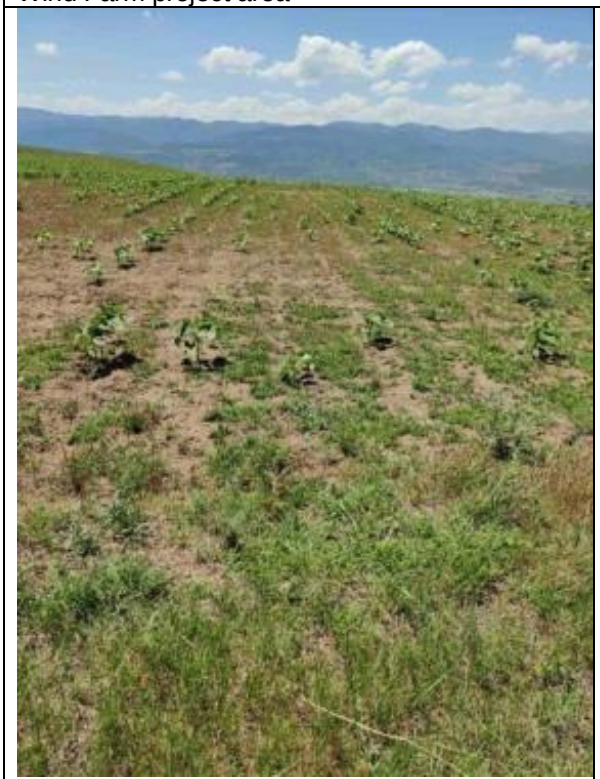


Photo 7 (Site I) construction ground of T18 tower

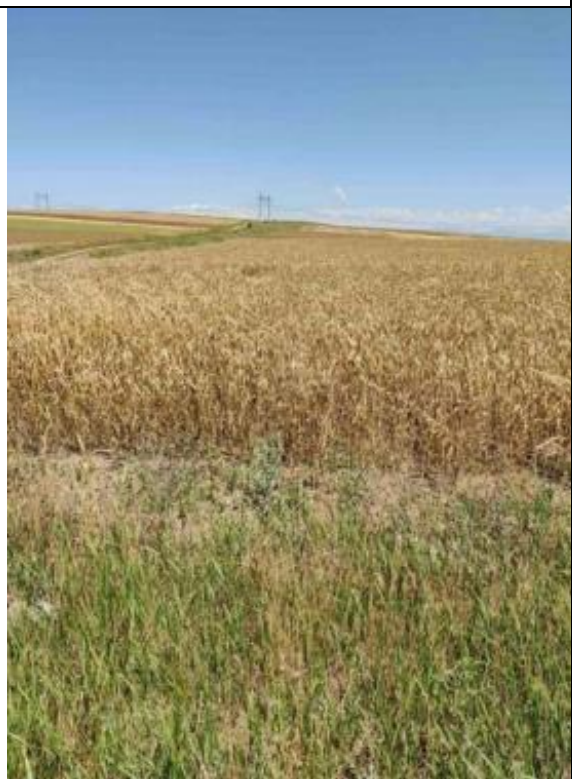


Photo 8 (Site I) View from T18 tower in the direction of T18

Photos evidence (06.07.2022)

Project name: GC-2231 - Preliminary study of the engineering-geological conditions of Ruisi Wind Farm project area

Photo 9 (Site III) View on T58 (accumulative relief slightly inclined to the southeast)

Photo 10 (Site II) T35 Construction ground

Photos evidence (06.07.2022)

Project name: GC-2231 - Preliminary study of the engineering-geological conditions of Ruisi Wind Farm project area

Photo 11 (Site IV) View on T22

Photo 12 (Site IV) View on T11 (accumulative relief slightly inclined to the southwest, to East Prone River)

Photos evidence (06.07.2022)

Project name: GC-2231 - Preliminary study of the engineering-geological conditions of Ruisi Wind Farm project area

Photo 13 (Site V) View on T15 (accumulative relief slightly inclined to the southwest, to Mtkvari River)

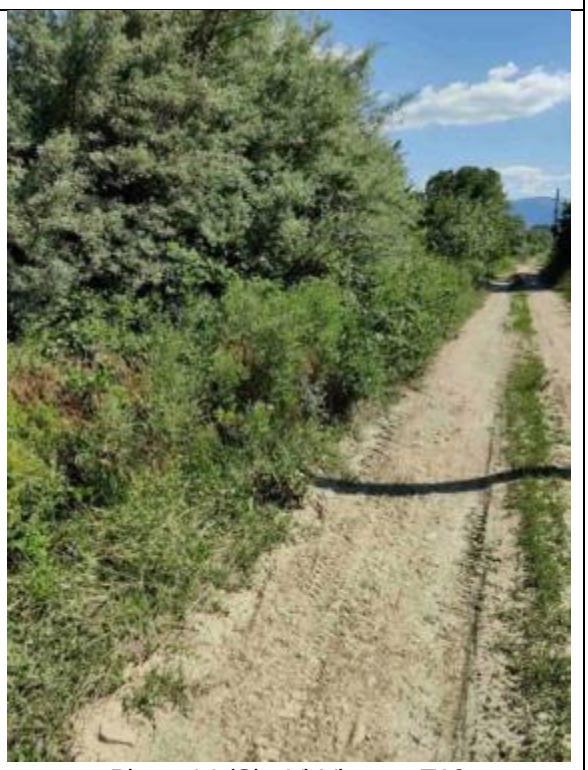


Photo 14 (Site V) View on T10

Photos evidence (06.07.2022)

Project name: GC-2231 - Preliminary study of the engineering-geological conditions of Ruisi Wind Farm project area

Photo 15 (Site VII) TO4

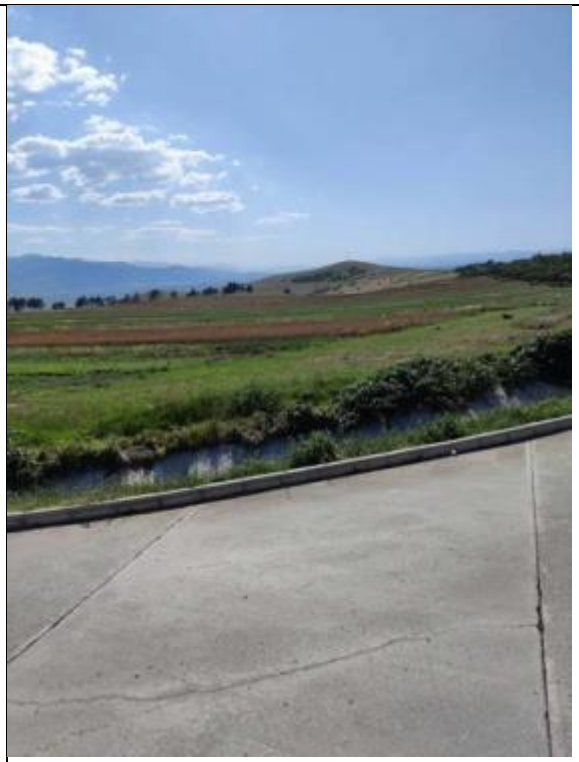


Photo 16 (Site VII) TO1

Annex 2. ToR

To: Mr. Leri Mikaberidze,

Director General of Geoengineering Ltd.

Terms of Reference

Client: JSC Wind Power

Project name: Preliminary study of the engineering-geological conditions of 206 MW Ruisi Wind Farm project area

General description of works:

General physical-geographical description of the project (project area and its adjacent areas):

- Climate.
- Geological environment: tectonics, geological structure, geological map of the environment.
- Geomorphology.
- Modern geodynamic processes and evaluation of hazardous geological processes.
- Mapping of landslide areas, mudflows and erosive sites based on visual observations (if there are landslide or other risky zones identified, later, for the EIA and detailed design, it will be necessary to describe them based on the engineering-geological study as well as appropriately select the site and plan preventive and mitigation measures). As per our information, no such phenomena are identified.

Hydrogeological description of the environment (the zone the area belongs to, expected types of ground waters).

A brief description of the detailed engineering-geological study planned to implement by the Client and geological team to locate the towers of wind turbines and for the detailed design in general.

Lasha Iordanishvili,

Director General of JSC “Wind Power” *(signed)*

Annex 2. Flora Survey Report

Environmental and Social Impact Assessment for the Construction and Operation of Ruisi Wind Power Plant

Flora, Vegetation and Habitats

Experts botanists: **Mariam Kimeridze,**
David Chelidze
7-12.06.2022; 1-10.07.2022

1. Introduction

The report comprises the results of literature review and field surveys which aimed to describe flora and vegetation of the area selected for the Ruisi Wind Power Plant Project, and in particular to identify sensitive plant communities and habitats there.

The botanic description of the area of interest has been prepared based on the literature sources and field surveys as well as the professional experience and knowledge of the experts. It should be mentioned that the field studies have enabled to fill existing data gaps, and to obtain detailed information needed for proper planning and environmental impact assessment from botanical point of view. Based on this, potential adverse and residual impacts on flora and vegetation of the Project Area and adjoining territories have been identified for the construction and operational phases.

Within the Project impact zone there are represented plant communities and species of different conservation value (endemic, rare) as well as economic plants (medicinal, aromatic, wild fruits, fibres, rootcrops, ornamental, beverages, timber, fuel wood, forage (fodder) and pasture, wild relatives of crop species, etc.).

Together with threatened species and sensitive habitats (sites) of different conservation value, special attention is paid to forested areas, because any residual impact on them requires eco-compensation measures to restore equivalent forest habitats. In case of wetland habitats, residual impact on them leads to the expansion of the surface water area and such a territory is permanently lost for the useful land fund. Although these surface water ecotopes are eventually covered by wetland vegetation resulting in peat accumulation, it takes thousand years to fill up voids with organic mass.

2. Legal Framework

Existing environmental legislation in Georgia is based on internationally recognized principles and criteria and represents good basis for the environmental impact assessment.

Georgia's general wild flora and fauna conservation measures are regulated by several legislative acts adopted by the Georgian Parliament in 1994-20011. In this context is crucial Decree N303 of May 2, 2006 of the President of Georgia, "On Approval of the Red List of Georgia" (Endangered Species List).

Table 1. Main environmental laws of Georgia

Law	**Date**
Law on Protection of Flora from Harmful Organisms	12.10.1994
The Constitution of Georgia	24.08.1995
Law on Protected Area System	07.01.1996
Law on Normative Acts	29.10.1996
Law on Environmental Protection	10.12.1996
Law on Wildlife	26.12.1996
Law on State Ecological Expertise	01.01.1997
Law on Environmental Permits	01.01.1997
Law on Creation and Management of the Kolkheti Protected Areas	09.12.1998
Law on Changes and Amendments into the Law on Protection of Flora from Harmful Organisms	16.04.1999
The Forest Code	22.06.1999
National Environmental Action Plan of Georgia	19.06.2000
Law on Melioration of Lands	16.10.2000
Law on Special Preservation of State Forest Fund and the Plantation within the Tbilisi City and Neighbouring Territories	10.11.2000
Law on Expansion of Borjomi-Kharagauli National Park	28.03.2001
Law on Red Data List and Red Data Book of Georgia	06.06.2003
Law on State Control of Nature Protection Law on Red Data List of Georgia	23.06.2005 6.04.2003

The following are the Multilateral International Conventions and Agreements related to nature conservation and biodiversity enforced in Georgia:

- *Convention on International Trade in Endangered Species of Wild Fauna and Flora* (CITES 1975; universal);
- *Convention on Biological Diversity* (*CBD* 1992; universal);
- *European Union Habitats Directives* (1992; regional);
- *Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat--Ramsar Convention* (1975; universal);
- *Convention concerning the Protection of the World Cultural and Natural Heritage* (*World Heritage Convention*; 1972; universal);
- *United Nations Framework Convention on Climate Change* (UNFCC 1994; universal) and (*Kyoto Protocol* adopted 1997; universal);
- *Convention on the conservation of European Wildlife and natural Habitats* (*Bern Convention* 1979);
- *European Landscape Convention 2000*.

3. Methodological and Conceptual Issues (Approaches) Concerning Flora/Vegetation Description and Identification of Project Impact on Ecosystems and Habitats

Ecosystems along the Project impact zone are usually characterized in terms of habitat/vegetation types such as identified in Ketskhoveli (1960), Nakhutsrishvili (1999), Kvachakidze (1996), etc. Species composition of different ecosystems and habitats are given on the base of bibliographic data and field surveys.

According to our estimation many plant species (vascular mainly) are represented within the corridor of interest of the Project. However, as stated by Morris (1995) “In principle, assessment of the flora should

include all vascular plants, bryophytes, lichens, algae (including stoneworts) and fungi, although the importance of the groups varies in different communities". Nonetheless, vascular plants are considered to be the main indicator of terrestrial ecosystems, e.g. all forms of life in a given landscape.

As mentioned above together with endangered plant species and sensitive habitats having different conservation value special attention is paid to forested areas including artificial forest plantations. This is on the ground that forests are considered as special environmental protection areas, unique and most important ecosystems with high ecological, aesthetic, cultural, historical and geological properties (Harcharik, 1997; Isik et al., 1997). In other words, "forests are more valuable as forests than under some other forms of land use" (Harcharik, 1997), "people are making greater demands on forests for recreation, pleasure, scenery and conservation of biological diversity" (Lanly, 1997).

It is of decided significance that on project impact areas, among them in the cases of Project construction through forested territories it is practically impossible to reinstate and maintain former natural stands in the state before construction. Consequently, the recommendation is given to implement Forest eco-compensation programmes (Forest offset) or offset other ecosystems/plant communities to mitigate residual impacts due to Project construction activities. In case of residual impact on wetland habitats as it is promoting extension of the surface water area and such areas become forever lost for the useful land fund. Although wetland vegetation on the surface water ecotopes is re-developed and peat accumulation takes place, it takes thousands of years to fill up these voids with organic mass.

Detrimental impacts to the protection of biodiversity, protected areas and forestry have to be reduced to the absolute minimum and unavoidable residual environmental damages have to be offset by an eco-compensation scheme. In particular the impacts on forest ecosystems have to be evaluated and offset by adequate mitigation and eco-compensation measures with the goal to restore the equivalent forest habitat.

In this context the calculation of damages to forest ecosystems by the Project construction activities according to the "none-net loss", "net gain principle" and "habitat hectare" approach is recommended to define the exact ratio for forest eco-compensation based upon modern methodologies and international best practice.

The habitat hectare scoring method is a common approach to determine the value of vegetation in non-monetary units. The environmental proxy used i.e. the "currency" in which the value of vegetation is expressed is the "habitat hectare". The habitat score is derived by assessing a number of site-based habitat and landscape components against a pre-determined 'benchmark'. Benchmarks have to be defined for different ecological vegetation classes (EVCs).

habitat area [ha] x habitat score = habitat-hectares

This method serves to assess a number of site-based habitat and landscape components against a pre-determined 'benchmark' relevant to the vegetation type being assessed. Benchmarks have to be defined for different ecological vegetation classes (EVC). The benchmark for each EVC has to describe the average characteristics of mature and apparently long undisturbed biodiversity and native vegetation occurring in the bioregions in which habitats shall be assessed. The notion of mature and apparently long undisturbed benchmark is relative to the EVC; e.g. a forest benchmark can be based on the average for stands of 200 year old trees with no signs of significant anthropogenic disturbance. Each EVC must contain a range of information required for carrying out a habitat hectare scoring exercise. When carrying out a habitat hectare scoring exercise a habitat score indicating the quality of the vegetation relative to the EVC benchmark is assigned to each of the areas assessed. Multiplying the habitat score by the habitat area (in hectares) allows determining the quality of vegetation. Whereby units of "habitat hectares" are used as a common measuring rod to compare the relative value of

different ecosystems within one EVC. The habitat hectare exercise foresees an *in-situ* assessment of natural vegetation to collect a range of visually assessed information of several vegetation components across the habitat zone. The vegetation components that have to be included and assessed depend on the eco-region specific ecosystem composition.

In a second step the visually assessed information on the vegetation components is analysed and used to calculate the habitat score for the area.

The components of the habitat score can be weighted. The Australian State Government of Victoria, Department of Sustainability and Environment, which is a worldwide leading institution in applying the habitat hectare approach, uses the following components and weights:

	Component	**Max. value (%)**
Site condition	Large trees	10
	Tree (canopy) cover	5
	Understorey (non-tree) strata	25
	Lack of weeds	15
	Recruitment	10
	Organic litter	5
	Logs	5
Landscape context	Patch size*	10
	Neighbourhood*	10
	Distance to core area*	5
	Total	**100**

*Components may be derived with assistance from maps and other (e.g. GIS) information sources.

Table 2. Components and weightings of the habitat score in Victoria, Australia

4. General Overview of Flora and Vegetation of Project Area

The project corridor is located in the territory of **the geobotanical district of Shida Kartli lowland**, where vegetation cover forms a complex picture in terms of genetics (origin) and structural organization. In prehistoric (geologic) time the territory of this district including plains and hill sides were almost completely overgrown by forests among which Georgian oak (*Quercus iberica*), hornbeam (*Carpinus caucasica*), Oriental beech (*Fagus orientalis*), oak-hornbeam and beech-hornbeam forests were dominant. Forest cover gradually reduced and even completely disappeared in many places (mainly over plains) more recently (during historical period). Riparian forests growing over river side terraces of the r. Mtkvari and its tributaries factually completely vanished. Secondary vegetation of hemixerophilous and xerophilous scrub and grass cenosis developed in some sections of previously forested areas; however, their major portion was converted into agricultural lands.

Forest vegetation is mainly preserved in Kldekari area of Mtskheta. These forests are mainly presented by low productivity secondary forests of Georgian oak (*Quercus iberica*). Among species mixed there (assectators) should be mentioned common ash (*Fraxinus excelsior*), field maple (*Acer campestre*), hornbeam (*Carpinus caucasica*), lime (*Tilia caucasica*), etc.. The understory in oak groves is mainly created by Oriental Hornbeam (*Carpinus orientalis*) with admixture of Cornelian cherry (*Cornus mas*), common hazel (*Corylus avellana*), common privet (*Ligustrum vulgare*), common medlar (*Mespilus germanica*), juniper (*Juniperus rufescens*, *Juniperus oblonga*), dog rose (*Rosa canina*), etc.. Community of Juniper (*Juniperus polycarpos*, *J. foetidissima*) which comprises vegetation of relict forests and is representative of arid forests is found in environs of Mtskheta City (slopes of the Kvernaki hill range). Surroundings of Mtskheta-Tbilisi also shelter other elements of arid open woodlands including communities of Atlantic pistachio (*Pistacia mutica*), Caucasian hackberry (*Celtis caucasica*), willow-leaved pear (*Pyrus salicifolia, P. georgica*) - they are scattered fragmentally there. A narrow (often discontinuous) strip of riparian forest grows along the first terrace of the r. Mtkvari and its main tributaries. Forest forming species include black poplar (*Populus nigra*), gray poplar (*Populus canescens*), willow (*Salix excelsa*), alder (*Alnus barbata*), pedunculate oak (*Quercus pedunculiflora*), elm (*Ulmus suberosa, U. foliacea*), etc..

Hemixerophilous and xerophilous scrubs are rather widespread within the district (over plains, hillsides). Majority of these vegetation is of secondary character and they replaced forests that covered plains, floodplains and hillsides. Communities of Jerusalem thorn (Paliurus spina-christi), Spirea (Spiraea hypericifolia), Oriental hornbeam (Carpinus orientalis), polydominant scrubs (Black buckthorn - Rhamnus pallasii, Jerusalem thorn - Paliurus spina-christi, Spirea - Spiraea hypericifolia, juniper – Juniperus oblonga, J. rufescens, dog rose - Rosa canina, R. corymbifera, wilde jasmine - Jasminum fruticans, smoketree - Cotinus coggygria, elm-leaved sumach - Rhus coriaria, howthorn - Crataegus kyrtostyla, honeysuckle - Lonicera caucasica, blackthorn - Prunus spinosa, black-wood - Cotoneaster racemiflora, etc.) dominate among scrubs. The driest habitats, namely shallow and skeletal soils of south-facing slopes are occupied by xerophilous scrubs - communities of tragacanth astragali (*Astragalus microcephalus*), prickly-thrift (*Acantholimon lepturoides, A. fomini*), *Thymus tiflisiensis*, etc.

Steppe grass formations widely spread in the territory of this district (together with hemixerophilous scrubs). Among them specifically should be mentioned bluestem community (*Bothriochloa ischaemum*), which should be accounted for secondary vegetation in this area. Groups of feather-grass steppe communities (*Stipa stenophylla*, *St. lessingiana*, *St. capillata*) mainly encounter fragmentally on small plots, most frequently between hemixerophilous scrubs (Jerusalem thorn, Spirea, Oriental hornbeam and other shrubs). Of them, feather-grass and bluestem communities often create complex groups. Pure bluestem (*Bothriochloa ischaemum*) steppes are mainly associated to an interfluvial plain relief. Dry slopes are often covered by bidominant groups of bluestem-fescue (*Bothriochloa ischaemum*, *Festuca sulcata*) steppes. Besides, feather-grass and fescue-feather-grass steppes are associates with slopes. The driest variant of steppe vegetation are represented by steppe groups where dominant species is fescue (*Festuca sulcata*) - they bound to and frequently transit to semi-deserts of wormwood (*Artemisia fragrans*) community. On the territory of this district, the latter mostly encounters in small plots, on the driest and often slightly saline soils, mainly on interfluvial plain relief. Sinusia of ephemeral, ephemeroidal and other species (*Alyssum desertosum, Bromus japonicas, Poa bulbosa*) develop within wormwood cenosis in the early spring. Rarely there could be encountered bidominant communities of semi-desert vegetation, specifically communities of *Artemisia fragrans - Salsola dendroides*, *Artemisia fragrans - Salsola ericoides*, etc. - they occupy small plots and grow fragmentally.

Fragments of wetland vegetation are presents at places nearby floodplains. Relatively large wetlands are developed on banks of man-made reservoirs and natural lakes - common read (*Phragmites communis*), breadleaf cattail (*Typha latifolia*), etc. are described there.

5. Detailed Description of Flora and Vegetation of the Project Corridor

As mentioned, the detailed botanical survey covered the area of the proposed Ruisi Wind Power Plant, which is located in the geobotanical district of Shida Kartli lowland. On this basis, potential adverse impacts and anticipated residual impacts of the planned construction and operation activities have been predicted for flora and vegetation of the project corridor and adjacent areas. The plant communities and species of the conservation value (Red List, endemic and/or rare species) and economically valuable plants were identified within the project impact zone as a result of these surveys.

Cover and abundance of vegetation were estimated using the Drude Scale during the botanical survey. The symbols of the Drude Scale denote cover-abundance of plant species. These symbols include: Soc (socialis) – dominant species, coverage is more than 90%; Cop^3 (coptosal) – very abundant species, coverage 70-90%; Cop^2 – species is presented by many individuals, coverage 50-70%; Cop^1 – coverage 50-70%; Sp^3 (sporsal) – coverage about 30%; Sp^2 (sporsal) – coverage about 20%; Sp^1 (sporsal) – coverage about 10%; Sol (solitarie) – few individuals, coverage about to 10%; Un (unicum) – a single individual.

In addition, all habitats identified during the botanical surveys of the Project Area were assigned codes according to the **EUNIS** Habitats Classification as well as the codes according to **the EU Habitat Directive** where applicable (the field surveys were carried out on 7- 12. 06. 2022; and on 1-10.07.2022).

Plot 1. Wind Turbine #39. GPS coordinates X 409213.08/ Y 4656841.26. 672m AMSL. Sagholasheni Village. Agricultural landscape - bean field, plum garden. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 1. Wind Turbine #39. Bean field

Plot 1. Wind Turbine #39. Plum garden

Plot 2. Wind Turbine #45. GPS coordinates X 409213.08/ Y 4657236.94. 676m AMSL. Sagholasheni Village. Agricultural landscape: wheat field, Epilobium parviflorum grows at the canal side. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 2. Wind Turbine #45. Epilobium parviflorum

Plot 2. Wind Turbine #45. Wheat field

Plot 3. Wind Turbine #44. GPS coordinates X 409755.5/ Y 4658002.31. 682m AMSL. Breti Village. Agricultural landscape: pepper field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 3. Wind Turbine #44. Pepper field

Plot 3. Wind Turbine #44. Pepper field

Plot 4. Wind Turbine #12. GPS coordinates X 410045.54/ Y 4660163.82. 718m AMSL. Breti Village. Agricultural Landscape: maize field, apple garden. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 4. Wind Turbine #12. Maize field

Plot 4. Wind Turbine #12. Apple garden

Plot 5. Wind Turbine #20. GPS coordinates X 410124.4/ Y 4660725.24. 727m AMSL. Dirbi Village. Agricultural landscape: wheat field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 5. Wind Turbine #20. Wind metering pylon

Plot 5. Wind Turbine #20. Wheat field

Plot 6. Wind Turbine #40. Wheat field

Plot 6. Wind Turbine #40. GPS coordinates X 409818.23/ Y 4661413.98. 727m AMSL. Dirbi Village. Agricultural landscape: wheat field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 7. Wind Turbine #46. Wheat field

Plot 7. Wind Turbine #46. GPS coordinates X 409849.63/ Y 4661879.23. 734m AMSL. Dzlevijvari Village. Agricultural landscape: wheat field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 8.. Maize field

Plot 8. GPS coordinates X 410623.03/ Y 4660956.01. 723m AMSL. Dzlevijvari Village. Agricultural Landscape: maize field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).** At the early stages of the project development – it was planned to locate here Wind Turbine #41. Currently, no turbines are located at this site

Plot 9. Wind Turbine #43. Wheat field

Plot 9. Wind Turbine #43. GPS coordinates X 408950.37/ Y 4662291.84. 739m AMSL. Dirbi Village. Agricultural landscape: wheat field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 10. Wind Turbine #25. Gramineous-forb meadow-pasture, EUNIS Category: **E1. (Dry grasslands); 62GE04 Vegetation of urban and rural areas**

Plant Community Type	**Gramineous herb meadow-pasture**
Conservation value	**Low**
Location	Dirbi Village.
Site No	Plot 10. Wind Turbine #22.
Assessed plot size (m^2)	10
GPS Coordinates	X 408830.02/Y 4661593.34
Altitude (m AMSL)	731∂
Aspect	_
Inclination	0^0
Structural Features of Community	
Height of herblayer (cm)	40
Coverage of herblayer (%)	50-60

Coverage of mosslayer (%)	_
Number of higher plant species	18
Number of moss species	_
Species	**Cover-abundance by Drude Scale**
Herblayer	
Agropyron repens	Cop^2
Thymus tiflisiensis - endemic to the Caucasus	Sp^3
Teucrium polium	Sp^2
Achillea millefolium	Sp^2
Achillea bieberstainii	Sp^2
Plantago media	Sp^1
Teucrium nuchense - endemic to the Caucasus	Sp^1
Lappula squarrosa	H-40cm, Sp^1
Gypsophylla elegans	Sp^1
Coronilla varia	Sp^1
Taraxacum officinalis	Sp^1
Medicago coerulea	Sp^1
Eryngium caucasicum	Sol
Sideritis commosa	Sol
Euphorbia seguieriana	Sol
Scabiosa georgica - endemic to the Caucasus	Sol
Falcaria vulgaris	Sol
Salvia aethiopis	Unicum
Mosslayer	
Moss species not found	_

Plot 10. Wind Turbine #25. Gramineous herb meadow-pasture

Plot 10. Wind Turbine #25. Gramineous herb meadow-pasture

Plot 10. Wind Turbine #25. Teucrium polium

Plot 10. Wind Turbine #25. Achillea bieberstainii

Plot 10. Wind Turbine #25. Achillea millefolium

Plot 10. Wind Turbine #25. Plantago media

Plot 10. Wind Turbine #25. Eryngium caucasicum

Plot 10. Wind Turbine #25. Teucrium nuchense

Plot 10. Wind Turbine #25. Sideritis commosa

Plot 10. Wind Turbine #25. Salvia aethiopis

Plot 11. Wind Turbine 21, Riparian woodland (degraded fragment), EUNIS Category: **G1. 1. (Riparian and gallery woodland, with dominant alder, birch, poplar or willow); 91F0 GE Riparian mixed forests**

Plant Community Type	**Oak-Oriental hornbeam forest**
Conservation Value	**Low**
Location	Sagholasheni Village
Site No	Plot 11. Wind Turbine #10.
Assessed plot size (m^2)	100
GPS Coordinates	X 408526.03/Y 4655428.26
Altitude (m AMSL)	659∂
Aspect	_

Inclination	0^0
Structural Features of Community	
Max. DBH (cm)	10
Average DBH (cm)	8
Max height of trees (m)	7
Average height of trees (m)	5
Number of trees on sample area	1-2
Coverage of tree layer (%)	50-60
Coverage of shrublayer (%)	70-80
Height of shrublayer (cm)	150
Coverage of herblayer (%)	60-70
Height of herblayer (cm)	100
Coverage of mosslayer (%)	_
Number of higher plant species	17
Species	**Cover-abundance by Drude Scale**
Treelayer	
Populus canescens	D-10cm, H-7m (max.) Cop^1
	D-8cm, H-5m (aver.)
Prunus divaricata	D-9cm, H-6m Sp^1
Malus orientalis	D-10cm, H-7m Sp^1
Cerasus silvestris	D-14-16cm, H-8-10m Sp^1
Acer campestre	D-6cm, H-6m Sol
Shrublayer	
Rubus sp.	Cop^2
Rosa canina	H-1.5m, Sp^2
Swida australis	Sp^1
Crataegus pentagyna	Sp^1
Herblayer	
Agropyron repens	Cop^2
Festuca rubra	Sp^1
Coronilla varia	Sp^1
Galium verum	Sp^2
Potentilla inclinata	Sp^1
Origanum vulgare	Sp^1
Agrimonia eupatoria	H-1m, Sol
Convolvulus arvensis	Sol
Mosslayer	
Moss species not found	_

Plot 11. Fruit-growing farm adjacent to **Wind Turbine #21**

Plot 11. Wind Turbine #21, Agrimonia eupatoria

Plot 11. Wind Turbine #21, riparian woodland

Plot 11. Wind Turbine #21, Populus canescens

Plot 11. Wind Turbine #21, Galium verum

Plot 11. Wind Turbine #21, riparian woodland

Plot 12. Wind Turbine #24. GPS coordinates X 408342.73/ Y 4654941.27. 655m AMSL. Bebnisi Village. Agricultural landscape: apple garden. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 12. Wind Turbine #24. Apple garden

Plot 12. Wind Turbine #24. Apple garden

Plot 13. Wind Turbine #22. GPS coordinates X 408569/ Y 4655828. 663m AMSL. Sagholasheni Village. Agricultural landscape: wheat and maize fields, land parcels under bean, cabbage, onion, potato and tomato. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 13. Wind Turbine #22. Land parcel under the cabbage

Plot 13. Wind Turbine #22. Wheat field

Plot 13. Wind Turbine #22. Bean field

Plot 13. Wind Turbine #22. Land parcel under the tomato

Plot 13. Wind Turbine #22. Land parcel under the onion

Plot 13. Wind Turbine #22. Potato field

Plot 13. Wind Turbine #22. Maize field

Plot 14. Wind Turbine #26. Gramineous-forb meadow-pasture, EUNIS Category: **E1. (Dry grasslands); 62GE04 Vegetation of urban and rural areas**

Plant Community Type	**Gramineous herb meadow-pasture**
Conservation Value	**Low**
Location	Bebnisi Village.
Site No	Plot 14. Wind Turbine #9.
Assessed plot size (m^2)	10
GPS Coordinates	X 417196.77/Y 4652107.02
Altitude (m AMSL)	709∂
Aspect	_
Inclination	0^0
Structural Features of Community	
Height of herblayer (cm)	40
Coverage of herblayer (%)	60-70
Coverage of mosslayer (%)	_
Number of higher plant species	18
Number of moss species	_
Species	**Cover-abundance by Drude Scale**
Herblayer	
Festuca rubra	Cop^1
Achillea millefolium	H-40cm, Sp^3
Achillea bieberstainii	Sp^2
Xeranthemum squarrosum	Sp^2
Teucrium polium	Sp^2
Euphorbia seguieriana	Sp^2
Centaurea solstitialis	Sp^1
Medicago tricornutum	Sp^1
Hirschfeldia incana	Sol
Sideritis comosa	Sol
Carthamus lanatus	Sol
Echium vulgare	Sol
Ajuga chia	Sol
Cardus crispus	Sol
Salvia verticillata	Sol
Plantago media	Sol
Eryngium caucasicum	Sol
Nedicago minima	Sol
Mosslayer	
Moss species not found	_

Plot 14. Wind Turbine #26. Achillea millefolium

Plot 14. Wind Turbine #26. Achillea millefolium

Plot 14. Wind Turbine #26. Achillea millefolium

Plot 14. Wind Turbine #26. Achillea bieberstainii

Plot 14. Wind Turbine #26. Achillea bieberstainii

Plot 14. Wind Turbine #26. Xeranthemum squarrosum

Plot 14. Wind Turbine #26. Gramineous herb meadow-pasture

Plot 14. Wind Turbine #26. Salvia verticillata

Plot 14. Wind Turbine #26. Salvia verticillata

Plot 14. Wind Turbine #26. Salvia verticillata

Plot 14. Wind Turbine #26. Xeranthemum squarrosum

Plot 14. Wind Turbine #26. Carthamus lanatus

Plot 14. Wind Turbine #26. Carthamus lanatus

Plot 14. Wind Turbine #26. Eryngium caucasicum

Plot 14. Wind Turbine #26. Carthamus lanatus

Plot 14. Wind Turbine #26. Centaurea solstitialis

Plot 14. Wind Turbine #26. Ajuga chia

Plot 14. Wind Turbine #26. Ajuga chia

Plot 14. Wind Turbine #26. Centaurea solstitialis

Plot 14. Wind Turbine #26. Xeranthemum squarrosum

Plot 14. Wind Turbine #26. Xeranthemum squarrosum

Plot 14. Wind Turbine #26. Echium vulgare

Plot 14. Wind Turbine #26. Echium vulgare

Plot 15. Wind Turbine #03. Gramineous-forb meadow-pasture, EUNIS Category: **E1. (Dry grasslands); 62GE04 Vegetation of urban and rural areas**

Plant Community Type	**Gramineous herb meadow-pasture**
Conservation Value	**Low**
Location	Urbnisi Village.
Site No	Plot 15. Wind Turbine #1.
Assessed plot size (m^2)	10
GPS Coordinates	X 418021.3/Y 4652219.65
Altitude (m AMSL)	608∂
Aspect	South
Inclination	$5\text{-}7^0$
Structural Features of Community	
Height of herblayer (cm)	50
Coverage of herblayer (%)	80-90
Coverage of mosslayer (%)	_
Number of higher plant species	16
Number of moss species	_
Species	**Cover-abundance by Drude Scale**
Herblayer	
Festuca rubra	H-50cm, Cop^2
Xeranthemum squarrosum	Sp^2
Festuca ovina	Sp^1
Teucrium polium	Sp^1
Euphorbia seguieriana	Sp^1
Potentilla inclinata	Sp^1
Sideritis comosa	Sol
Centaurea iberica	Sol
Onobrychis cyri - endemic to the Caucasus	Sol
Jurinea cartaliniana - endemic to the Caucasus	Sol
Falcaria vulgaris	Sol
Lappula squarrosa	Sol
Achillea millefolium	Sol
Stipa pulcherrima	Sol
Achillea biebersteinii	Sol
Salvia nemorosa	Sol
Mosslayer	
Moss species not found	_

Plot 15. Wind Turbine #03. Gramineous herb meadow-pasture

Plot 15. Wind Turbine #03. Gramineous herb meadow-pasture

Plot 15. Wind Turbine #03. Jurinea cartaliniana

Plot 15. Wind Turbine #03. Jurinea cartaliniana

Plot 15. Wind Turbine #03. Jurinea cartaliniana

Plot 15. Wind Turbine #03. Onobrychis cyri

Plot 15. Wind Turbine #03. Teucrium polium

Plot 16. Wind Turbine #09. Gramineous-forb meadow-pasture, EUNIS Category: **E1. (Dry grasslands); 62GE04 Vegetation of urban and rural areas**

Plant Community Type	**Gramineous herb meadow-pasture**
Conservation Value	**Low**
Location	Urbnisi Village.
Site No	Plot 16. Wind Turbine #4.
Assessed plot size (m^2)	10
GPS Coordinates	X 418136.44/Y 4651995.14
Altitude (m AMSL)	747∂
Aspect	North-West
Inclination	$3\text{-}5^0$
Structural Features of Community	
Height of herblayer (cm)	50
Coverage of herblayer (%)	70-80
Coverage of mosslayer (%)	_
Number of higher plant species	15
Number of moss species	_
Species	**Cover-abundance by Drude Scale**
Herblayer	
Festuca rubra	Cop^2
Xeranthemum squarrosum	Sp^2
Teucrium polium	Sp^1
Centaurea solstitialis	Sp^1
Potentilla inclinata	Sp^1
Hirschfeldia incana	Sp^1
Euphorbia seguieriana	Sp^1
Sideritis comosa	Sp^1
Centaurea iberica	Sp^1
Echium vulgare	H-50cm, Sp^1
Lappula squarrosa	Sp^1
Stipa pulcherrima	Sol
Salvia nemorosa	Sol
Eryngium coeruleum	Sol
Carduus crispus	Sol
Mosslayer	
Moss species not found	_

Plot 16. Wind Turbine #09. Gramineous herb meadow-pasture

Plot 16. Wind Turbine #09. Gramineous herb meadow-pasture

Plot 16. Wind Turbine #09. Centaurea solstitialis

Plot 16. Wind Turbine #09. Sideritis comosa

Plot 16. Wind Turbine #09. Teucrium polium

Plot 17. Wind Turbine #08. Pine forest (planted), EUNIS Category: **G3. 4. (Pine forests)**

Plant Community Type	**Pine forest (planted)**
Conservation Value	**Medium**
Location	Ruisi Village
Site No	Plot 17. Wind Turbine #6.
Assessed plot size (m^2)	100
GPS Coordinates	X 417575.47/Y 4652925.48
Altitude (m AMSL)	753∂
Aspect	_
Inclination	0^0
Structural Features of Community	
Max. DBH (cm)	40
Average DBH (cm)	20
Max height of trees (m)	8
Average height of trees (m)	6
Number of trees on sample area	2-3
Coverage of tree layer (%)	30-40
Coverage of shrublayer (%)	_
Height of shrublayer (cm)	_
Coverage of herblayer (%)	60-70
Height of herblayer (cm)	50
Coverage of mosslayer (%)	_
Number of higher plant species	31
Species	**Cover-abundance by Drude Scale**

Treelayer	
Pinus nigra	D-40cm, H-7-8m (max.) Cop^3
	D-20cm, H-6-7m (aver.)
	D-10cm, H-5-6m (aver.)
Shrublayer	
Shrublayer is not developed.	–
Herblayer	
Festuca rubra	Cop^2
Stipa pulcherrima	Cop^1
Thymus tiflisiensis - endemic to the Caucasus	Sp^3
Dactylis glomerata	Sp^2
Phleum pratense	Sp^2
Medicago coerulea	Sp^1
Poa angustifolia	Sp^1
Euphorbia seguieriana	Sp^2
Teucrium polium	Sp^1
Achillea bieberstainii	Sp^1
Plantago lanceolata	Sp^1
Taraxacum officinalis	Sp^1
Achillea millefolium	Sp^1
Agropyron repens	Sp^1
Stachys atherocalyx	Sol
Carduus crispus	H-50cm, Sol
Artemisia caucasica	Sol
Galium tricornutum	Sp^1
Coronilla varia	Sp^1
Tripleurospermum nummularium	Sol
Galium verum	Sol
Allium atroviolaceum	Sol
Scabiosa georgica - endemic to the Caucasus	Sol
Teucrium nuchense - endemic to the Caucasus	Sol
Falcaria vulgaris	Sol
Achillea millefolium	Sol
Salvia verticillata	Sol
Tragopogon graminifolius	Sol
Lapulla squarrosa	Sol
Mosslayer	
Moss species not found	_

Plot 17. Wind Turbine #08. Pine forest (planted)

Plot 17. Wind Turbine #08. Pine forest (planted)

Plot 17. Wind Turbine #08. Stachys atherocalyx

Plot 17. Wind Turbine #08. Stachys atherocalyx

Plot 17. Wind Turbine #08. Teucrium polium

Plot 17. Wind Turbine #08. Achillea bieberstainii

Plot 17. Wind Turbine #08. Artemisia caucasica

Plot 17. Wind Turbine #08. Carduus crispus

Plot 17. Wind Turbine #08. Falcaria vulgaris

Plot 18. Wind Turbine #07. GPS coordinates X 416479.04/ Y 4653661.11. 744m AMSL. Ruisi Village. Agricultural landscape: sunflower field, wheat field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 18. Wind Turbine #07. Sunflower field

Plot 18. Wind Turbine #07. Sunflower field

Plot 18. Wind Turbine #07. Wheat field

Plot 19. Wind Turbine #07. Bean field, wheat field

Plot 19. Wind Turbine #07. GPS coordinates X 416151.06/ Y 4654791.76. 775m AMSL. Ruisi Village. Agricultural landscape: bean field, wheat field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 20. Wind Turbine #13. Sunflower field

Plot 20. Wind Turbine #13. GPS coordinates X 416431.31/ Y 4654244.13. 753m AMSL. Ruisi Village. Agricultural landscape: sunflower field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 21. Wind Turbine #10. Wheat field

Plot 21. Wind Turbine #10. GPS coordinates X 416644.78/ Y 4655589.38. 800m AMSL. Ruisi Village. Agricultural landscape: wheat field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 22. Wind Turbine #15. Gramineous-forb meadow-pasture, EUNIS Category: **E1. (Dry grasslands); 62GE04 Vegetation of urban and rural areas**

Plant Community Type	**Gramineous herb meadow-pasture**
Conservation Value	**Low**
Location	Arashenda Village.
Site No	Plot 22. Wind Turbine #23.
Assessed plot size (m^2)	10
GPS Coordinates	X 417153.32/Y 4656074.71
Altitude (m AMSL)	805∂
Aspect	North-East
Inclination	$2\text{-}3^0$
Structural Features of Community	
Height of herblayer (cm)	40
Coverage of herblayer (%)	30-40
Coverage of mosslayer (%)	_
Number of higher plant species	16
Number of moss species	_
Species	**Cover-abundance by Drude Scale**
Herblayer	
Festuca rubra	H-40cm, Sp^3
Lappula squarrosa	Sp^2
Euphorbia seguieriana	Sp^2
Plantago lanceolata	Sp^2
Dactylis glomerata	Sp^1
Teucrium polium	Sp^1

Achillea bieberstainii	Sp[1]
Sanguisorba officinalis	Sp[1]
Salvia aethiopis	Sol
Teucrium nuchense - endemic to the Caucasus	Sol
Carduus crispus	Sol
Scabiosa georgica - endemic to the Caucasus	Sol
Salvia verticillata	Sol
Xanthium spinosum – invasive species	Sol
Achillea millefolium	Sol
Falcaria vulgaris	Sol
Mosslayer	
Moss species not found	

Plot 22. Wind Turbine #15. Gramineous herb meadow-pasture

Plot 22. Wind Turbine #15. Salvia verticillata

Plot 22. Wind Turbine #15. Salvia verticillata

Plot 22. Wind Turbine #15. Teucrium polium

Plot 22. Wind Turbine #15. Achillea bieberstainii

Plot 23. Wind Turbine #06. Arable land

Plot 23. Wind Turbine #06. GPS coordinates X 418082.92/ Y 4656054.78. 785m AMSL. Arashenda Village. Agricultural landscape: arable land. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 24. Wind Turbine #16. Wheat field

Plot 24. Wind Turbine #16. GPS coordinates X 417805.22/ Y 4656035.79. 782m AMSL. Arashenda Village. Agricultural landscape: wheat field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 25. Wind Turbine #02. GPS coordinates X 416147.68/ Y 4656021.81. 820m AMSL. Arashenda Village. Agricultural landscape: wheat field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 25. Wind Turbine #02. Wheat field

Plot 25. Wind Turbine #02. Wheat field

Plot 26. Wind Turbine #01. Gramineous-forb meadow-pasture, EUNIS Category: **E1. (Dry grasslands); 62GE04 Vegetation of urban and rural areas**

Plant Community Type	**Gramineous herb meadow-pasture**
Conservation Value	**Low**
Location	Arashenda Village.
Site No	Plot 26. Wind Turbine #2.
Assessed plot size (m^2)	10
GPS Coordinates	X 416221.89/Y 4656151.42
Altitude (m AMSL)	815∂
Aspect	_
Inclination	0^0
Structural Features of Community	
Height of herblayer (cm)	35
Coverage of herblayer (%)	30-40
Coverage of mosslayer (%)	_
Number of higher plant species	16
Number of moss species	_
Species	**Cover-abundance by Drude Scale**
Herblayer	
Festuca rubra	Sp^3
Plantago lanceolata	Sp^2
Dactylis glomerata	Sp^2
Euphorbia seguieriana	Sp^2
Lapulla squarrosa	Sp^2
Teucrium polium	Sp^1
Salvia nemorosa	Sp^1
Achillea bieberstainii	Sp^1
Sanguisorba officinalis	Sol
Teucrium nuchense - endemic to the Caucasus	Sol
Scabiosa georgica - endemic to the Caucasus	Sol
Carduus crispus	H-35cm, Sol
Salvia verticillata	Sol
Falcaria vulgaris	Sol
Salvia aethiopus	Sol
Artemisia caucasica	Sol
Mosslayer	
Moss species not found	_

Plot 26. Wind Turbine #01. Salvia nemorosa

Plot 26. Wind Turbine #01. Gramineous herb meadow-pasture

Plot 26. Wind Turbine #01. Artemisia caucasica

Plot 27. Wind Turbine #04. Gramineous-forb meadow-pasture, EUNIS Category: **E1. (Dry grasslands); 62GE04 Vegetation of urban and rural areas**

Plant Community Type	**Gramineous herb meadow-pasture**
Conservation Value	**Low**
Location	Ruisi Village.
Site No	Plot 27. Wind Turbine #25.
Assessed plot size (m^2)	10
GPS Coordinates	X 415835.23/Y 4656488.01
Altitude (m AMSL)	807∂
Aspect	_
Inclination	0^0
Structural Features of Community	
Height of herblayer (cm)	30
Coverage of herblayer (%)	30-40
Coverage of mosslayer (%)	_
Number of higher plant species	15
Number of moss species	_
Species	**Cover-abundance by Drude Scale**
Herblayer	
Festuca rubra	Sp^3
Agropyron repens	Sp^2
Lapulla squarrosa	Sp^2
Centaurea ovina	Sp^2
Sanguisorba officinalis	Sp^3
Teucrium polium	Sp^1
Euphorbia seguieriana	Sp^1
Achillea bieberstainii	Sp^1
Plantago lanceolata	Sp^1
Carduus crispus	Sol
Salvia verticillata	Sol
Sideritis commosa	Sol
Scabiosa georgica - endemic to the Caucasus	H-30cm, Sol
Reseda lutea	Sol
Salvia aethiopus	Sol
Mosslayer	
Moss species not found	_

Plot 27. Wind Turbine #25. Salvia verticillata

Plot 27. Wind Turbine #25. Gramineous herb meadow-pasture

Plot 28. Wind Turbine #17. Gramineous-forb meadow-pasture, EUNIS Category: **E1. (Dry grasslands); 62GE04 Vegetation of urban and rural areas**

Plant Community Type	**Gramineous herb meadow-pasture**
Conservation Value	**Low**
Location	Ruisi Village.
Site No	Plot 8. Wind Turbine #16.
Assessed plot size (m^2)	10
GPS Coordinates	X 415815.78/Y 4656759.1
Altitude (m AMSL)	804∂
Aspect	_
Inclination	0^0
Structural Features of Community	
Height of herblayer (cm)	35
Coverage of herblayer (%)	30-40
Coverage of mosslayer (%)	_
Number of higher plant species	17
Number of moss species	_
Species	**Cover-abundance by Drude Scale**
Herblayer	
Festuca rubra	Sp^3
Centaurea ovina	Sp^2
Agropyron repens	H-30cm, Sp^2
Lapulla squarrosa	Sp^2
Sanguisorba officinalis	Sp^2
Plantago lanceolata	Sp^1
Achillea bieberstainii	Sp^1
Salvia verticillata	Sol
Sideritis commosa	Sol
Salvia aethiopus	Sol
Carduus crispus	Sol
Teucrium polium	Sol
Euphorbia seguieriana	Sol
Achillea millefolium	Sol
Falcaria vulgaris	Sol
Salvia nemorosa	Sol
Taraxacum officinale	Sol
Mosslayer	
Moss species not found	_

Plot 28. Wind Turbine #17. Achillea bieberstainii

Plot 29. Wind Turbine #29. Wheat field

Plot 29. Wind Turbine #29. GPS coordinates X 414815.84/ Y 4655492.83. 750m AMSL. Ruisi Village. Agricultural landscape: wheat field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 30. Wind Turbine #11. Wheat field

Plot 30. Wind Turbine #11. GPS coordinates X 413908.31/ Y 4655479.39. 860m AMSL. Ruisi Village. Agricultural landscape: wheat field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 31. Wind Turbine #36. Wheat field

Plot 31. Wind Turbine #36. GPS coordinates X 413641/ Y 4657454.91. 742m AMSL. Ruisi Village. Agricultural landscape: wheat field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 32. Wind Turbine #41. Wheat field

Plot 32. Wind Turbine #41. GPS coordinates X 413118.58/ Y 4656858.28. 730m AMSL. Ruisi Village. Agricultural landscape: wheat field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 33. Wind Turbine #28. Wheat field, carrot field

Plot 33. Wind Turbine #28. GPS coordinates X 412551.17/ Y 4657054.34. 735m AMSL. Ruisi Village. Agricultural landscape: wheat field, carrot field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 34. Wind Turbine #19. GPS Coordinates X 412533.94 ,Y 4656737.87 727m AMSL. Ruisi Village. Agricultural landscape: wheat field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 34. Wind Turbine #19. Drop irrigation

Plot 34. Wind Turbine #19. Wheat field

Plot 35. Wind Turbine #14. Land parcel under the onion

Plot 35. Wind Turbine #14. GPS coordinates X 412463.1/ Y 4655938.91. 732m AMSL. Ruisi Village. Agricultural landscape: onion field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 36. Wind Turbine #37. GPS coordinates X 414716/ Y 4659024. 710m AMSL. Sakasheti Village. Agricultural Landscape: maize field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 36. Wind Turbine #37. Maize field

Plot 36. Wind Turbine #37. Maize field

Plot 37. Wind Turbine #38. Apple garden

Plot 37. Wind Turbine #38. GPS coordinates X 4659453.81/ Y 414886.97. 711m AMSL. Sakasheti Village. Agricultural landscape: apple garden. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 38. Wind Turbine #42. Maize field

Plot 38. Wind Turbine #42. GPS coordinates X 415656.27/ Y 4659501.34. 710m AMSL. Sakasheti Village. Agricultural Landscape: maize field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 39. Wind Turbine #27. GPS coordinates X 416764.95/ Y 4658951.01. 715m AMSL. Variani Village. Agricultural landscape: apple garden. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 39. Wind Turbine #27. Apple garden

Plot 39. Wind Turbine #27. Apple garden

Plot 40. Wind Turbine #23. Apple garden

Plot 40. Wind Turbine #23. GPS coordinates X 416904.81/ Y 4659723.95. 705m AMSL. Variani Village. Agricultural landscape: apple garden. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 41. Maize field

Plot 41. GPS coordinates X 416251.55/ Y 4660097.52. 711m AMSL. Sakasheti Village. Agricultural Landscape: maize field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).** At the early stages of the project development – it was planned to locate here Wind Turbine #55. Currently, no turbines are located at this site.

Plot 42. Maize field

Plot 42. GPS coordinates X 418031.89/ Y 4659708.53. 702m AMSL. Variani Village. Agricultural Landscape: maize field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).** At the early stages of the project development – it was planned to locate here Wind Turbine #29. Currently, no turbines are located at this site.

Plot 43. Wind Turbine #30. Wheat field

Plot 43. Wind Turbine #30. GPS coordinates X 417651.41/ Y 4659044.98. 705m AMSL. Variani Village. Agricultural landscape: wheat field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 44. cherry garden

Plot 44. GPS coordinates 417420.26/4661246.77. 714m AMSL. Variani Village. Agricultural landscape: cherry garden. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).** At the early stages of the project development – it was planned to locate here Wind Turbine #30. Currently, no turbines are located at this site.

Plot 45. Wind Turbine #Alt21. Lucerne field.

Plot 45. Wind Turbine #Alt21. Sakasheti Village. Agricultural landscape: Lucerne field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).** At the early stages of the project development – it was planned to locate here Wind Turbine alternative #21. Currently, no turbines are located at this site

Plot 46. Maize field

Plot 46. Variani Village. Agricultural Landscape: maize field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).** At the early stages of the project development – it was planned to locate here Wind Turbine #56. Currently, no turbines are located at this site.

Plot 47. Wind Turbine #Alt13. Maize field

Plot 47. Wind Turbine #Alt13. Variani Village. Agricultural Landscape: maize field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 48. Maize field

Plot 48. GPS coordinates X 416480.12 , Y 4660973.20, 716m AMSL. Variani Village. Agricultural Landscape: maize field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).** At the early stages of the project development – it was planned to locate here Wind Turbine #37. Currently, no turbines are located at this site.

Plot 49. Wind Turbine #Alt52. Wheat field

Plot 49. Wind Turbine #Alt52. GPS coordinates X 416480.12/ Y 4660973.2. 716m AMSL. Sakasheti Village. Agricultural landscape: wheat field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

► **Alternative locations**

Plot 50. Pepper and cabbage fields

Plot 50. GPS coordinates X 412744.92/ Y 4661817.23. 724m AMSL. Dzlevijvari Village. Agricultural landscape - pepper and cabbage fields. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).** At the early stages of the project development – it was planned to locate here Wind Turbine #40. Currently, no turbines are located at this site.

Plot 51. Wind Turbine #28. Maize field

Plot 51. Wind Turbine #28. GPS coordinates X 412522.23/ Y 4661414.32. 717m AMSL. Dzlevijvari Village. Agricultural Landscape: maize field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).**

Plot 52. Maize field

Plot 52. GPS coordinates X 412917.56/ Y 4662251.69. 730m AMSL. Dzlevijvari Village. Agricultural Landscape: maize field. The site has low conservation value. **EUNIS** Category: **I. (Regularly or recently cultivated agricultural, horticultural and domestic habitats).** At the early stages of the project development – it was planned to locate here Wind Turbine #39. Currently, no turbines are located at this site.

6. Sensitive Areas/ Habitats

The detailed botanical survey of the project corridor enabled to identify and comprehensively characterize sensitive sites in this area. Based on the literature review and field surveys only one medium sensitivity site/habitat has been identified in the project corridor:

► **The methodology used to assess the sensitivity of flora and vegetation receptors is as follows:**

Morris&Therivel (1995) has been used to assess the significance of various plant communities (Table 2):

Table 2: Assessment criteria according to Morris&Therivel (1995)

Criterion	High	Medium	Low
Species abundance	High diversity of species is recorded or may be recorded. Endemic or threatened species of the Red List of Georgia and/or Red List of IUCN is recorded or could be present.	Characterized by medium species diversity. Only few rare or threatened species are present.	Characterized by low species diversity. Threatened species are not impacted virtually.
Naturalness and modification level	Natural or insignificantly modified habitats	Moderately modified habitats, e.g. those which are still capable to maintain characteristic species	Highly modified habitats
Anthropogenic impact	Anthropogenic impact is very low or absent.	Anthropogenic impact is low.	Anthropogenic impact is high (grazing, logging, etc.)
Rareness and geographic extent of habitat	Rare or threatened habitat at the country or regional level.	Habitat is not very characteristic to the region	Habitat is characteristic for the country.

► **Medium Sensitivity Sites/ Habitats:**

Plot 17. Wind Turbine #6. Pine forest (planted), EUNIS Category: **G3. 4. (Pine forests).** Ruisi Village. GPS coordinates X 417575.47/ Y 4652925.48. Altitude (m AMSL) 753. Of the tree species is recorded: Pinus nigra; shrublayer is not developed; and grass species are represented by: *Festuca rubra,* Stipa pulcherrima, *Thymus tiflisiensis* - endemic to the Caucasus, Dactylis glomerata, Phleum pratense, Medicago coerulea, Poa angustifolia, Euphorbia seguieriana, Teucrium polium, Achillea bieberstainii, Plantago lanceolata, Taraxacum officinalis, Achillea millefolium, Agropyron repens, Stachys atherocalyx, Carduus crispus, Artemisia caucasica, Galium tricornutum, Coronilla varia, Tripleurospermum nummularium, Galium verum, Allium atroviolaceum, Scabiosa georgica - endemic to the Caucasus, Teucrium nuchense - endemic to the Caucasus, Falcaria vulgaris, Achillea millefolium, Salvia verticillata, Tragopogon graminifolius, Lapulla squarrosa. Moss layer is not developed.

► **Habitats of the EU Habitat Directive**

The Project area comprises the following two types of habitats of the EU Habitat Directive:

- **62GE04 Vegetation of urban and rural areas**

1) General description

Vegetation of village settlements and cultivable land is extremely interesting from the point of view of plants of economic importance. In this habitat there are various species of aborigine, invasive and adventive cosmopolitan plants related to wild relatives of cultural plants and those used in traditional

(people's) and scientific medicine, including, Chicory - Cichorium intybus, meliot - Melilotus officinalis, yarrow - Achillea milllefolium, agrimony – Agrimonia eupatoria, creeping couch-grass - Agropyron repens, white briony - Bryonia dioica, shepherd's purse - Capsella bursa-pastoris, greater calistine - Chelidonium majus, European dodder - Cuscuta europaea, henbane - Hyoscyamus niger, mother of nettle - Lamium album, forest mallow - Malva sylvestris, mint – Mentha arvensis, great plantain - Plantago major, chickweed - Stellaria media, dandelion - Taraxacum officinale, coltsfoot - Tussilago farfara, nettle -Urtica dioica, etc. These plants are distributed on the territories of the city and village settlements, roadsides and transformed habitats. Most of them, as pioneer plants, create primary successions on eroded slopes as a result of industrial activities and construction works.

2) Species

Plants: Achillea milllefolium, Aegilops tauschii, Agrimonia eupatoria, Agropyron repens, Avena barbata, A. fatua, Beta corolliflora, Brassica elongata, Bryonia dioica, Capsella bursa pastoris, Chelidonium majus,Cichorium intybus, Coriandrum sativum, Cornus mas, Corylus avellana, Cuscuta europaea, Cydonia oblonga, Ficus carica, Fragaria vesca, Hyoscyamus niger, Juglans regia, Lamium album, Lathyrus spp., Onobrychis spp., Linum austriacum, Malus oriantalis, Malva sylvestris, Medicago spp., Melilotus officinalis, Mentha aquatica, Mentha arvensis, Mespilus germanica, Morus alba, Plantago major, Prunus cerasifera, Punica granatum, Pyrus caucasica, P. salicifolia, Raphanus rapinastrum, Rubus spp., Satureja spicigera, S. laxiflora, Setaria viridis, Solanum nigrum, Stellaria media, Taraxacum officinale, Tussilago farfara, Urtica dioica, Vicia spp.

- 91F0 GE Code of Georgia: Riparian mixed forests

91F0 of Quercus robur, Ulmus laevis and Ulmus minor, Fraxinus excelsior or Fraxinus angustifolia didi mdinareebis gaswvris (Ulmenion minoris). PAL. CLASS.: 44.4

1) General description of Riparian Forests in Georgia

The riparian forest is common on the banks of large rivers and lowland areas. Dominant species are: Flood plane oak (Quercus pedunculiflora=Q. longipes), wing-nut (Pterocarya fraxinifolia), white aspen (Populus alba), oleaster (Elaeagnus angustifolia), tamarisk (Tamarix ramosissima, T. hohenackeri), buckthorn (Hippophaë rhamnoides. Trees are covered with lianas - Vitis vinifera ssp. sylvestris, Periploca graeca, Cynanchum acutum, Solanum persicum, etc.

In Colchic riparian forests are dominated by hornbeam and beech. Rhododendron, Ponto and Colchic butcher's broom, blackberry, smilax and silk-vine create a understory in Abkhazia. In Samegrelo oak and wild pear adds to the beech and hornbeam. Planted forests of the small area of such a forest are common in the gorges of rivers Tekhura and Abasha.

In Kartli, on the bank of river Mtkvari the forest dominating with flood-plane oak and white aspen is developed. In the middle of the Kartli elm (Ulmus minor) and mulberry (Morus alba) add to these species with multiple scrub and lianas. In Tbilisi surroundings the flood plane is developed in the gorges of river Mtkvari (village Kavtiskhevi) and river Aragvi (village Natakhtari). Here the white leaf aspen (Populus hybrida) is the dominant species. The rest are those growing in the above-described forests – flood plane oak, mulberry, elm, buckthorn, tamarisk, silk-vine, smilax, honey suckle, hops, clematis. The herbal cover is rich. European dogbane (Apocynum) and Solenanthus biebersteinii are found only in this place.

At the lower current of Mtkvari, from Gardabani to the border of Azerbaijan a typical aluvial forest is developed. A. Grosshaim calls it the Tugai type forest. Forests of such a type are common in Georgia in the coast line of Iori, Alazani and Mtkvari.

The moist riparian forest at the lower stream of river Mtkvari is composed of large size trees that are covered with lianas. From trees the following can be found: the flood plane oak (Quercus pedunculiflora), black aspen (Populus nigra), the white leaf aspen (Populus hybrida), elm (Ulmus minor), white willow (Salix alba); From bushes: hawthorn (Crataegus monogyna), cornelius (Cornus mas), blackberry (Rubus spp.), privet (Ligustrum vulgare); lianas – ivy (Hedera helix), wild vine (Vitis vinifera ssp. sylvestris), smilax (Smilax excelsa), silk-vine (Periploca graeca), valerian (Clematis

vitalba); Herbaceous plants are: red clover (Trifolium pratense), white clover (T. repens), cock's foot (Dactylis glomerata).

In Kakheti riparian forests are extremely moist and frequently get covered with water. Alazani flood planes occupy the largest area, which is stretched along the central part of Alazani valley and its width gradually increases towards the direction of Kiziki. The forest is extremely dense and almost impassable. Besides the oak tree the species that dominate are: hornbeam (Carpinus betulus), maple (Acer velutinum), lime (Tilia begoniifolia), ash (Fraxinus excelsior), elm (Ulmus minor), wild pear (Pyrus caucasica), mulberry (Morus alba), black mulberry (M. nigra). In more moist areas dominate wing-nut (Pterocarya fraxinifolia), persimmon (Diospyros lotus), black aspen (Populus nigra), white leaf aspen (Populus hybrida), species of the willow and alder. The understory is created by hawthorn (Crataegus pentagyna), medlar (Meslipus germanica), nut, elder dogwood. In drier places there are species of hawthorn, cornel, sour plum, quince, apple, wild pear, and common maple. From lianas there are: ivy (Hedera helix), wild grapevine (Vitis vinifera ssp. sylvestis), Clematis vitalba, smilax (Smilax excelsa). From herbaceous plants - Oplismenus undulatifolium, Circaea lutetiana, Stachys sylvatica, Asperula odorata, Pachyphragma macrophyllum, Lapsana grandiflora, Sanicula europaea, Geranium robertianum, Salvia glutinosa. Fern and danewort are widely distributed. Here as well Althaea cannabina, A. officinalis, Datisca cannabina, Lysimachia dubia, L. verticillaris are mixed. The Iori flood plane is preserved in its original form in Koruhi, Sagarejo region and is strentxhed at the length of about 1 km. The types common in this forest are: flood plane oak, wtite aspen and elm. Ash, mulberry and oleaster are rare. In the understory tamarisk, hawthorn, pomegranate and berberis are common. As for liana type plants, those widespread here are clematis, from herbaceous plants - Cynanchum acutum, Plantago lanceolata, Sisymbrium loeselii and sedges.

2) Species

Plants: Acer campestre, A. velutinum, Alnus barbata, Althaea cannabina, A. officinalis, Apocynum venetum, Asperula odorata, Berberis iberica, Carpinus betulus, Circaea lutetiana, Clematis vitalba, Crataegus pentagyna, Cydonia oblonga, Cynanchum acutum, Dactylis glomerata, Datisca cannabina, Elaeagnus angustifolia, Fraxinus excelsior, Geranium robertianum, Hedera helix, Lapsana grandiflora, Lysimachia dubia, L. verticillaris, Malus orientalis, Meslipus germanica, Morus alba, M. nigra, Oplismenus undulatifolium, Pachyphragma macrophyllum, Periploca graeca, Plantago lanceolata, Populus alba, P. hybrida, P. nigra, Prunus divaricata, Punica granatum, Pyrus caucasica, Quercus pedunculiflora, Salvia glutinosa, Sambucus ebulus, Sanicula europaea, Sisymbrium loeselii, Smilax excelsa, Solenanthus biebersteinii, Stachys sylvatica, Tamarix ramosissima, T. hohenackeri, Tilia begoniifolia, Trifolium pratense T. repens, Ulmus minor, Vitis sylvestris.

7. Other Habitats of Concern

Xanthium spinosum, which is invasive species for Georgia, is recorded within the Project Area, in the environs of Arashenda Village (Turbine #15). **The habitat is represented by gramineous-forb meadow-pasture, EUNIS Category: E1. (Dry grasslands); 62GE04 Vegetation of urban and rural areas**. Usually it grows in the lower and middle mountain zones, in rural areas, road sites, pebbly terrain, nearby residential areas, abandoned and cultivated fields, along irrigation canals and pebbly beaches, as well as at the edges of vegetable gardens and crop fields as weed species. Invaded from America. This species is spread almost in all regions of Georgia, and also encounters throughout the Caucasus region. The global EOO of the species include: West Siberia, Far East, Middle Asia, Europe, Mediterranean Region, Asia Minor, America, Australia.

The Project Area comprises only small population of this species (Sol (solitarie) - few individuals, coverage about to 10%). Considering that small population of the invasive species is already present in the Project Area and widespread throughout Georgia, associated potential risks and relevant mitigation measures will be defined to avoid distribution of this species in the territories where it has not intruded yet.

8. Rare, Endemic and Georgian Red List Species Recorded in the Project Corridor

The plant species of the Red List of Georgia have not been found in the project corridor during the detailed botanical field surveys.

It should be also mentioned, that the species protected under the Bern Convention and the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1975; universal) do not grow within the project corridor either.

On the other hand, five species that are endemic to the Caucasus have been found there, including:

1. Thymus tiflisiensis - Originally described in Georgia. The extent of occurrence (EOO) comprises: Kartli, Kakheti and Trialeti in Georgia, and Quazax and Eilar-Oughy in Azerbaijan. Grows in the lower and middle mountain zones in dry terrain, could be encountered in the Jerusalem thorn and Jerusalem thorn - beard-grass communities, in the beard-grass - feather-grass meadows.
2. Teucrium nuchense - Originally described in Azerbaijan. The EOO comprises: Svaneti, Racha, Lechkhumi, Trialeti, Kartli, Khevsureti, Kakheti, Javakheti and Meskheti regions in Georgia, and Azerbaijan. Grows in dry slops, screes, forest glades, shrublands from the mountain foothills to 2350 masl elevation.
3. Scabiosa georgica - Originally described in Georgia. The EOO: Racha-Lechkhumi, Imereti, Kartli, Kakheti, Trialeti in Georgia, the North Caucasus (Dagestan), Transcaucasia (Azerbaijan, Armenia). Grows in forest zone, on dry and stony slopes, in shrublands, forest edges, pebbly terrain.
4. Onobrychis cyri - Originally described in Georgia. The EOO: Kartli, Kakheti, Trialeti in Georgia, North Caucasus (Dagestan), Transcaucasia (Azerbaijan). Grows on stony slopes in the lower mountain zone.
5. Jurinea cartaliniana - Originally described in Georgia. The EOO: Kartli, Meskheti in Georgia, the North Caucasus (central). Grows in the middle mountain zone, on rocks.

9. Assessment of Adverse Impacts of Construction and Operation Phases and Respective Mitigation Measures

The detailed botanical surveys have identified populations of species of high and medium conservation value in the Project Corridor. Adverse impacts that the construction and operation of the planned project may have on botanical receptors (flora and vegetation) were assessed. Findings of the impact assessment will be used to develop and specify conservation/restoration and offset measures, and prepare respective biorestoration specifications, compensation plans and monitoring plan for the botanical component of the biodiversity. In addition, a conservation programme shall be prepared for rare plant species that include the following: Thymus tiflisiensis - endemic to the Caucasus; Teucrium nuchense- endemic to the Caucasus; Scabiosa georgica - endemic to the Caucasus; Onobrychis cyri- endemic to the Caucasus; Jurinea cartaliniana - endemic to the Caucasus.

Description of the background situation will facilitate to the post-project monitoring of botanical component of biodiversity and restoration measures implemented on territories identified to compensate for the project impacts.

Populations of endemic and rare species were assessed quantitatively and qualitatively in the frames of the botanical survey, and specific mitigation measures were developed on this basis - their specifications will be provided in reinstatement, biorestoration and compensation measures plans. The implementation of these measures will guarantee the protection and conservation of those populations of high conservation value plant species that will be either directly or indirectly affected during the construction period as well as restoration of vegetation cover within the project corridor.

The following measures are recommended to ensure conservation of plants: translocation of live plants to conservation centers and reproduction of plants using seeds collected in the wild. The translocation of live plants is always associated with high risk and therefore target plants should be propagated with seeds to achieve higher success of conservation measures and grow enough seedlings for reintroduction into relevant habitats.

Annex 3. Fauna Survey Report

2022

Executive Summary

The aim of this report is to discuss the potential impacts and mitigation measures of the construction of Ruisi Wind Farm on the environment. The assessment considers the plans for the project and addresses current environmental concerns and how to manage them. The faunal study provides the negative and positive aspects of the project in order to identify ways to avoid its pitfalls at an early stage (before getting construction) and to guarantee the protection and preservation of the environment and natural resources; in particular, the potential inhabitants and target species who are in direct interaction with the safety of the area.

This report has provided an overview of potential environmental impacts of the Ruisi Wind Farm generation. The conclusion, that it is possible to construct wind farms without significant damage of the environment, is supported by the results from environmental impact assessments conducted in the project construction corridor. Only one site - wind turbine T06 must be taken in to consideration, which is represented with the artificial pine grove, which is more sensitive that other sites in the Wind Farm area.

1. Background

1.1. Description of the Project Area

The project area locates in Kareli Municipality near the villages Sagholasheni, Breti, Dzlevidjhvari, Sakasheti, Sasireti and Ruisi (in region of Shida-Kartli, East Georgia). The selected corridor for the construction of the Ruisi Wind Farm covers approximately 13 000 ha area within the coordinates 42.04109°N/43.88183°E, 42.11177°N/43.89318°E and 42.10780°N/44.01710°E, 42.00846°N/44.01355°E. The proposed site of the construction of Ruisi Wind Farm project is located 100 km west from Tbilisi. The Project Ruisi Wind Farm assumes to build the 46 wind turbines and development of a power grid for power evacuation from 210 MW wind farm.

The Ruisi Wind Farm construction corridor is located at elevation of approximately 657 to 845 from the sea level. The site located on small hill north of village Ruisi consist of conglomerates, sandstones and clays. The allocated site of the wind farm project is mostly open area without natural vegetation coverage. The most area of Wind Farm is typically small agricultural lands and orchards, large open spaces of pastures and fields separated by field bounds, channels and ground roads. The Ruisi wind farm construction corridor is generally without tree vegetation, only one site - wind turbine T06 is represented with the artificial pine grove with area of 35 ha (Pic. 1, 2).

Picture 1. Artificial pine grove

Picture 2. Artificial pine grove

1.2. Development of Wind Farms and Potential Impact on the Habitats and Fauna

Wind farms, as facilities for production of electricity, have the potential impact in the natural and urban environment. This report provides an overview of the impacts on habitats and fauna that have been discussed in relation to wind farms. During the construction of the wind farm, negative impact on the fauna present in the project area is not significant.

1.2.1. Impacts on the Habitats

The negative impacts on the habitats of the Wind Farm construction site on soil and topography, air quality and land during the construction phase are expected to be short term and do not present significant problems.

In terms of their origin, habitats of the project area are divided in two major categories: 1. Semi-natural and 2. Anthropogenic habitats. In the project territory of the Ruisi Wind Farm, semi-natural habitats include artificial pine grove, remains of the windbreak lines, shrubs and grasslands; anthropogenic habitats are agricultural lands with different kind of vegetables and fruit orchards, overgrazed pastureland and degraded fields. The anthropogenic influence on the habitats of the project construction area is significant and consist of mechanical (plowed and cultivate the land, excavation of irrigation canals and roads, overgrazed and degraded meadows) and chemical (using herbicides, insecticides, acaricides and fungicides) aspects. The potential significance of the project impact on habitats, existing within the project area, as it was assessed on the stage of scoping are presented in the Table 1.

Table 1. Habitats on the project construction area

N	**Habitat description**	**Impact**
1	Artificial pine grove	Average
2	Shrublands	Average
3	Windbreak line	Average
4	Overgrazed and degraded fields	Less significant
5	Grassland	Less significant
6	Agricultural field with corn, wheat and sunflower	Less significant
7	Agricultural field with vegetables (tomatoes, onion, peppers, cucumber, potatoes)	Less significant
8	Orchards (apple, cherries, plums, vineyards)	Less significant

The habitats that may be impacted by wind farm development are above mentioned semi-natural grasslands and artificial pine grove. The significant potential impacts on habitats that can result in the reduction or loss of biodiversity are 1. Direct loss of habitat due to the construction of development infrastructure, including turbine foundations, supporting facilities, roads, quarries and borrow pits; 2. Degradation of habitats through alteration or disturbance; 3. Fragmentation of habitats and increased edge effects; 4. Degradation and loss of habitats outside the development site that may arise from pollution, siltation or erosion originating from within the development site.

A summary of the potential impacts of the habitats associated with the project during the construction and operation phases is presented in major conclusion and recommendations.

1.2.2. Impacts on the Animal Species

There are a number of potential impacts on the species in the project area of wind farm development. This report provides an overview of the impacts on mammals and birds that have been discussed in relation to wind farms.

Birds - The impact of wind turbines on birds is the most researched area relating to wind power and the environment. The extent to which birds will be impacted by wind energy developments is depending on species, season and location and these impacts may be temporary or permanent. The species

considered to be most at risk are birds of prey, swans and geese. Potential impacts on migratory birds and local bird movements between egg-laying, feeding and brooding areas require careful consideration.

The following significant potential impacts to birds from Wind Farm developments in the project construction area have been identified: 1. Disturbance during the construction and operational phases from the development site and its surroundings; 2. Collision mortality; 3. Barrier to movement; and 4. Direct loss or degradation of habitats.

The birds' colliding with the turbines is one of the main mortality reasons of the birds and special focus must be on population dynamics and migration. The risk of collision will vary greatly depending on the site, species and season. In order to fully evaluate the biological impact of birds colliding with wind turbines the data must be seen in relation to population size of the specific species and the demographic characteristics of that particular species. Onshore studies have suggested that raptors are more prone to collisions than other species on account of the abundance of individuals in close proximity to wind farms. However, other factors such as species-specific flight behavior, weather conditions and topography specific to each wind farm site have been suggested as more important.

Bats – The international studies have shown that wind farms can cause substantial numbers of bat mortalities. However, a comprehensive multi-year bat strike monitoring programs provides a strong indication that the actual impact of wind farms on bats is not significant.

Terrestrial vertebrates - No significant negative influences for most of large mammals, amphibians and the reptile's species.

2. Target species review in the project area of the construction of Ruisi Wind Farm

The selection of the target species has been based on potential generic impacts of wind power development projects. Though all wildlife species have been recorded during the zoological field surveys, particular attention has been paied to identify species particularly vulnerable to the potential impacts of the project, either on construction or on operation phase. In case of mammals, reptiles and amphibias, the target species have been defined as those protected nationally or globally, as well as under different conventions. For bird surveys, the target species have comprised breeding and migratory large-sized birds – mostly birds of prey. Table 2 gives the list of the target species for the study area together their protection status.

According to the IUCN Red Data List the species belong to the following categories: four are vulnerable species (VU and five are near threatened (NT). According to the Red Data List of Georgia, one species is critically endangered (CR) and eight species are vulnerable (VU). And great majority of the target species represent priority species for the Bern convention.

Table 2. Target species distributed in the habitats of Ruisi Wind Farm project area

Common (English) name	**Scientific (Latin) name**	**Status in IUCN**	**Red list of Georgia**	**Status in** Bern convention
Avifauna (Birds)				
Long-legged Buzzard	*Buteo rufinus*	LC	VU	priority species
Honey Buzzard	*Pernis apivorus*	LC	-	priority species
Black Kite	*Milvus migrans*	LC	-	priority species
Short-toed Eagle	*Circaetus gallicus*	LC	-	priority species
Common Buzzard	*Buteo buteo*	LC	-	priority species
Rough-legged Buzzard	*Buteo lagopus*	LC	-	priority species
Western Marsh-harrier	*Circus aeruginosus*	LC	-	priority species
Hen Harrier	*Circus cyaneus*	LC	-	priority species
Pallid Harrier	*Circus macrourus*	NT	-	priority species
Goshawk	*Accipiter gentilis*	LC	-	priority species
Lesser Spotted Eagle	*Aquila pomarina*	LC	-	priority species
Booted Eagle	*Hieraaetus pennatus*	LC	-	priority species

Common (English) name	Scientific (Latin) name	Status in IUCN	Red list of Georgia	Status in Bern convention
Common Kestrel	*Falco tinnunculus*	LC	-	priority species
Lesser Kestrel	*Falco naumanni*	LC	CR	priority species
Hobby	*Falco subbuteo*	LC	-	priority species
Montagu's Harrier	*Circus pygargus*	LC	-	priority species
Mammals				
Greater Noctule Bat	*Nyctalus lasiopterus*	VU	VU	
Greater Horseshoe Bat	*Rhinolophus ferrumequinum*	-	-	priority species
Mediterranean Horseshoe Bat	*Rhinolophus euryale*	NT	VU	-
Lesser Horseshoe Bat	*Rhinolophus hipposideros*	-	-	priority species
Lesser Mouse-eared Bat	*Myotis blythii*	-	-	priority species
Western barbastelle	*Barbastella barbastellus*	NT	VU	
Turkish hamster	*Mesocricetus brandti*	NT	VU	-
Grey dwarf hamster	*Cricetulus migratorius*	LC	VU	-
Stone Marten	*Martes foina*	LC	-	priority species
Eurasian Badger	*Meles meles*	LC	-	priority species
Least Weasel	*Mustela nivalis*	LC	-	priority species
Southern White-breasted Hedgehog	*Erinaceus concolor*	LC	-	-
European Hare	*Lepus europaeus*	LC	-	priority species
Reptilians				
Dice snake	*Natrix tessellata*	LC	-	priority species
European cat snake	*Telescopus fallax*	LC	-	priority species
Steppe Viper	*Vipera renardi*	VU	-	-
Collared Eirenis	*Eirenis collaris*	LC	VU	-
Greek tortoise	*Testudo graeca*	VU	VU	priority species
European pond turtle	*Emys orbicularis*	NT	-	priority species
Amphibians				
European green toad	*Bufo viridis*	LC	-	priority species
European tree frog	*Hyla arborea*	LC	-	priority species

Target species of bird

Results of survey of target bird species carried out in autumn 2021

Priority in observations in autumn 2021 was given to the target bird species, or diurnal Birds of Prey (Falconiformes) and Owls (Strigiformes). Besides that, specific attention has been paid to the collecting of data in the most sensitive areas and on the threatened bird species, which are included in the IUCN Red List, List of the Globally Threatened Birds in Europe and the Red list of Georgia, 2006.

In total, at least 553 individuals of 12 target species, or Birds of Prey (Falconiformes) and Owls (Strigiformes), which considered as a target species, recorded during surveys carried out within the limits of Ruisi WPP Project Area and in adjacent areas.

At least 297 individuals of 7 raptor species counted during direct visual observations carried out two vantage points. At least 193 individuals of 6 raptor species and 2 individuals of the Little Owl counted during surveys on foot. Besides that, 63 individuals of 6 raptor species observed during road-car surveys carried out in study area in October 2021.

The following 11 species of the Birds of Prey, which associated in the two families (Accipitridae – 10 species) and (Falconidae – 1 species) registered during field works:

ORDER - Birds of Prey (*FALCONIFORMES*) - 11 species

Family I/1. Buzzards, etc (*Accipitridae*) – 10 species
- Black Kite (*Milvus migrans*)
- Short-toed Snake-eagle (*Circaetus gallicus*)
- Eurasian Sparrowhawk (*Accipiter nisus*)
- Northern Goshawk (*Accipiter gentilis*)
- Common Buzzard (*Buteo buteo*)
- Long-legged Buzzard (*Buteo rufinus*)
- Rough-legged Buzzard (*Buteo lagopus*)
- Western Marsh Harrier (*Circus aeruginosus*)
- Northern Harrier (*Circus cyaneus*)
- Montagu's Harrier (*Circus pygargus*)

Family I/2. Falcons (*Falconidae*) - 1 species
- Common Kestrel (*Falco tinnunculus*)

3. Aim of the faunal assessment

Aims of the baseline faunal review of proposed project area of the construction of Ruisi Wind Farm are follows:

- Description of the impacts on the fauna within the project area of the Ruisi Wind Farm construction;
- Verify compliance of the Ruisi WPP project with national environmental regulations EBRD Requirements and World Bank Safeguard Policies;
- Indication of the negative effects caused by construction and operation of the Ruisi Wind Farm project area;
- Assessment of the importance of the study area for bats (*Chiroptera*) population and potential impact on those;
- Assessment of the potential impact on birds (*Aves*) populations from bird diversity conservation standpoint;
- Analysis of the ornithological situation within the limits of the Ruisi Wind Farm Project Area during the transit migrations of birds;
- Assessment of the bird wintering within the limits of Ruisi WPP Project Area, territorial distribution, habitat selection, numbers of observed individuals of target birds species and their flight activity;
- Habitat selection and territorial distribution of birds within the various sections of Ruisi Wind Farm Project area as well as in adjacent territory;
- Assessment of the mammal fauna and find all possible evidence of mammal species presence in the Project area;
- Assessment of the reptiles and amphibians fauna and have an idea on the usage of the territory of Project by these species
- Generate baseline data for monitoring and evaluation for the indication of efficiency of the mitigation actions implemented during the course of the project.

As the baseline, evaluation shows, the area/site proposed of the construction of Ruisi Wind Farm is located outside of the protected areas.

The protection of the environment on the study area is subject of the Georgian and international environmental regulations and policies that provide best practice and standards of protection the faunal diversity outside of protected areas.

4. Legal Framework

4.1 Georgian Red Data List and the legal framework of Georgia concerned to the protection of the flora and fauna

In 2003 the Parliament of Georgia adopted the Law on Red List and Red Book which gives the legal definitions of Red List and Red Book (relevant recommendations and methodological issues) of endangered species of Georgia. The Red List structure was also legally defined, as well as the relevant procedures for including species in the Red List, procedures for revising, and updating of it. The Law also regulates issues related to planning and financial matters connected with the protection, taking of rehabilitation and conservation of endangered species.

Laws that are in concern to the activities affecting the biodiversity that may occur during the construction of Ruisi Wind Farm are follows:

General laws on environmental protection	
Law	**Data of issue**
Constitution of Georgia	*24/08/1995*
Law of Georgia on “Environmental Protection”	*10/12/1996*
Law of Georgia on “Environmental Impact Permit”	*14/12/2007*
Law of Georgia on “Ecological Expertise”	*14/12/2007*
Decree of the Government of Georgia on “Approval of Environmental Technical Regulations"	*10/03/2015*
Decree of the Government of Georgia on "Technical Rules - Methods for Determining the Damage to Environment (calculation) for Approval"	*05/06/2015*
Law of Georgia on “Fees for Natural Resources”	*29/12/2004*
Law of Georgia on “Law on Protected Area System”	*07/01/1996*
“The Forest Code” of Georgia	*22/06/1999*
National Environmental Action Plan of Georgia	*19/06/2000*
Environmental safety	
Law	**Data of issue**
Law of Georgia on “Compensation of Damage caused by Hazardous Substances”	*23/07/1999*
Law of Georgia on “Protection of Flora from Harmful Organisms”	*12/10/1994*
Law of Georgia on “Changes and Amendments into the Law on Protection of Flora from Harmful Organisms”	*16/04/1999*
Wildlife conservation	
Law	**Data of issue**
Law of Georgia on “Wildlife animals”	*25/12/1996*
Law of Georgia on "Red List" and "Red Book"	*06/06/2003*
Law of Georgia on “Creation and Management of the Kolkheti Protected Areas”	*09/12/1998*

4.2. International legal framework

EIA document in compliance with EIA legislation directives and guidelines of European Union (EU); European Bank for Reconstruction and Development (EBRD).

Directive of EIA legislation of EU clarifies that the assessment should be of likely significant effects of the project on the environment. Modern update of the EIA legislation guideline of EU (2014) commits to the users to avoid harmful effect of infrastructural development on biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC” (i.e. the Habitats and Wild Birds Directives respectively). Where a project is simultaneously subject to an assessment under the Environmental Impact Assessment Directive and under the Habitats and/or Wild Birds Directives, the 2014 Directive requires that, where appropriate, either a coordinated procedure or a joint procedure should be used. The coordinated procedure requires designating an authority, or authorities, to coordinate separate assessments. The joint procedure, on the other hand, requires

Member States to endeavour to provide for a single assessment of a project's impacts on the environment (EU, 2016).

The commitments of Environmental and Social Policy (ESP, 2014) of European Bank for Reconstruction and Development (EBRD) to the bank are the promotion and support of the relevant projects to include measures to safeguard and, where feasible, enhance ecosystems and the biodiversity that these projects are supporting. Such approach of ESP aims to protect, conserve, manage and provide sustainable use of living natural resources. For the implement of these commitments, the ESP includes Performance Requirement (PR). Policy of protection of biological environment is reviewed in the PR6 (EBRD, 2019): Biodiversity Conservation and Sustainable Management of Living Natural Resources of the Environmental and Social Policies of EBRD. The objectives of PR6 are:

- To protect and conserve biodiversity using a precautionary approach;
- To adopt the mitigation hierarchy approach, with the aim of achieving no net loss of biodiversity, and where appropriate, a net gain of biodiversity; and
- To promote good international practice (GIP) in the sustainable management and use of living natural resources.

EBRD's Guidance Note 6 (2022) defines critical habitats (CHs) as the most sensitive biodiversity features, and the priority biodiversity features (PBFs) as "a sub-set of biodiversity that is irreplaceable or vulnerable, but at a lower priority level than critical habitats". The CH and PBF criteria defined by Guidance Note 6 are tiven Table 3:

Table 3. Criteria and conditions for identifying priority biodiversity features and critical habitats

Criterion	Priority Biodiversity Features	Critical Habitat
1. Priority ecosystems		
Threatened ecosystems (a) Habitats listed in Annex 1 of EU Habitats Directive (EU members only) or Resolution 4 of Bern Convention (signatory nations only) (b) IUCN Red-List EN or CR ecosystems	(PR6 para. 12-i) (a) EAAA is habitat type listed in Annex 1 of EU Habitats Directive or Resolution 4 of Bern Convention (b) EAAA < 5% of the global extent of an ecosystem type with IUCN status of CR or EN	(PR6 para. 14-i) (a) EAAA is habitat type listed in Annex 1 of EU Habitats Directive marked as "priority habitat type" (b) EAAA ≥5% of global extent of an ecosystem type with IUCN status of CR or EN (c) EAAA is ecosystem determined to be of high priority for conservation by national systematic conservation planning
2. Priority Species and their Habitats		
Threatened species (a) Species and their habitats listed in EU Habitats Directive and Birds Directive (EU members only) or Bern Convention (signatory nations only) (b) IUCN Red List EN or CR species (c) IUCN Red List VU species (d) Nationally or regionally (e.g., Europe) listed EN or CR species	(PR6 para. 12-ii) (a) EAAA for species and their habitats listed in Annex II of Habitats Directive, Annex I of Birds Directive, or Resolution 6 of Bern Convention (b) EAAA supports < 0.5% of global population OR < 5 reproductive units of a CR or EN species. (c) EAAA supports VU species (d) EAAA for regularly occurring nationally or regionally listed EN or CR species	(PR6 para. 14-ii) (a) EAAA for species and their habitats listed in Annex IV of the Habitats Directive (See EU restrictions) (b) EAAA supports ≥ 0.5% of the global population AND ≥ 5 reproductive units of a CR or EN species (c) EAAA supports globally significant population of VU species necessary to prevent a change of IUCN Red List status to EN or CR, and satisfies threshold (b) (d) EAAA for important concentrations of a nationally or regionally listed EN or CR species
Range-restricted species	(PR6 para. 12-ii) (a) EAAA for regularly occurring range-restricted species	(PR6 para. 14-iii) (a) EAAA regularly holds ≥ 10% of global population AND ≥ 10 reproductive units of the species

Criterion	Priority Biodiversity Features	Critical Habitat
Migratory and congregatory species	(PR6 para. 12-ii) (a) EAAA identified per Birds Directive or recognized national or international process as important for migratory birds (esp. wetlands)	(PR6 para. 14-iv) (a) EAAA sustains, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population at any point of the species' lifecycle (b) EAAA predictably supports ≥10 percent of global population during periods of environmental stress

5. Data collection, Field survey Methodology and Equipment

5.1. Faunal data collection

Faunal data were collected from the construction site of Ruisi Wind Farm. Preliminary the data on the animal species distributed in the habitats of the project territory were collected based on the literature dates (Kutubidze, 1966; Muskhelishvili & Chkhikvadze, 2000; Bukhnikashvili & Kandaurov, 2001; Muskhelishvili, 2002; Tarkhnishvili, 2002; Darchiashvili et al., 2004; Bukhnikashvili 2004; Bukhnikashvili et al., 2004; Bukhnikashvili et al., 2008; Pokryszko et al., 2011). The collected data were verified during the field surveys, based on the visual recognition of the habitats, finding of the traces (footprints, excrements, fur, feather etc.) of the animals in the predetermined territory of the construction of Ruisi Wind Farm and surrounding areas.

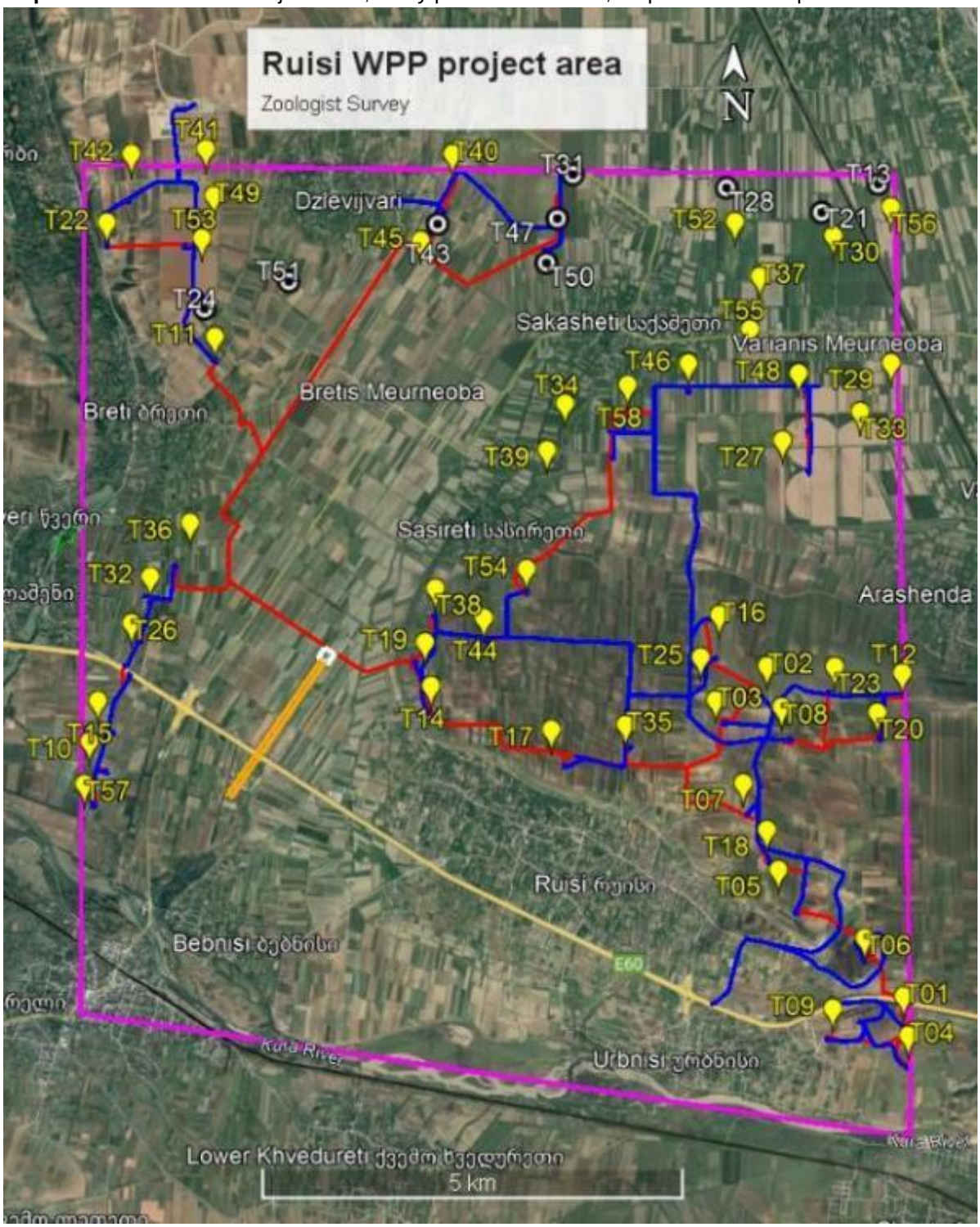
Fauna was described and species lists were created for the study area. The main results of observations (site descriptions, GPS coordinates, a number of individuals of some species, with short descriptions of visited locations, comments, etc.) are presented in the reports on field surveys.

Below we provide information related to mammals, amphibians, reptiles and other animal species different from birds and bats. Bird Survey and Bat Survey issues are covered in Annexes 4 and 5.

5.1.3. Mammals and other terrestrial vertebrates survey methodology (except bats and birds)

Data were collected during field excursions in 2-8 July 2022. Observations were conducted all the important sections of study area (50 preliminary selected sites and alternative sites for the construction of the wind turbines) crossed on foot and car during daylight hours (Map 5). The main results of observations (sites, GPS-data, found animal species, with some short descriptions of visited locations, comments, etc.) are presented in the reports on field survey below. Part of the WTG construction sites were inaccessible because land plots where they are situated are fenced by owners and entrance on these site is banned.

Map 5. Ruisi Wind Farm Project Area, study plots of mammals, amphibians and reptiles



Three groups of WTG construction sites situated in the different agricultural land plots were preselected for the field survey of mammals, amphibians and reptiles on the project area (Map. 6):

Group I

T26	408928.3	4656841.26	672 m.a.s.l.
T32	409213.08	4657236.94	676 m.a.s.l.
T36	409755.5	4658002.31	682 m.a.s.l.
T11	410045.54	4660163.82	718 m.a.s.l.
T24	410124.4	4660725.24	727 m.a.s.l.
T41	410623.03	4660956.01	723 m.a.s.l.

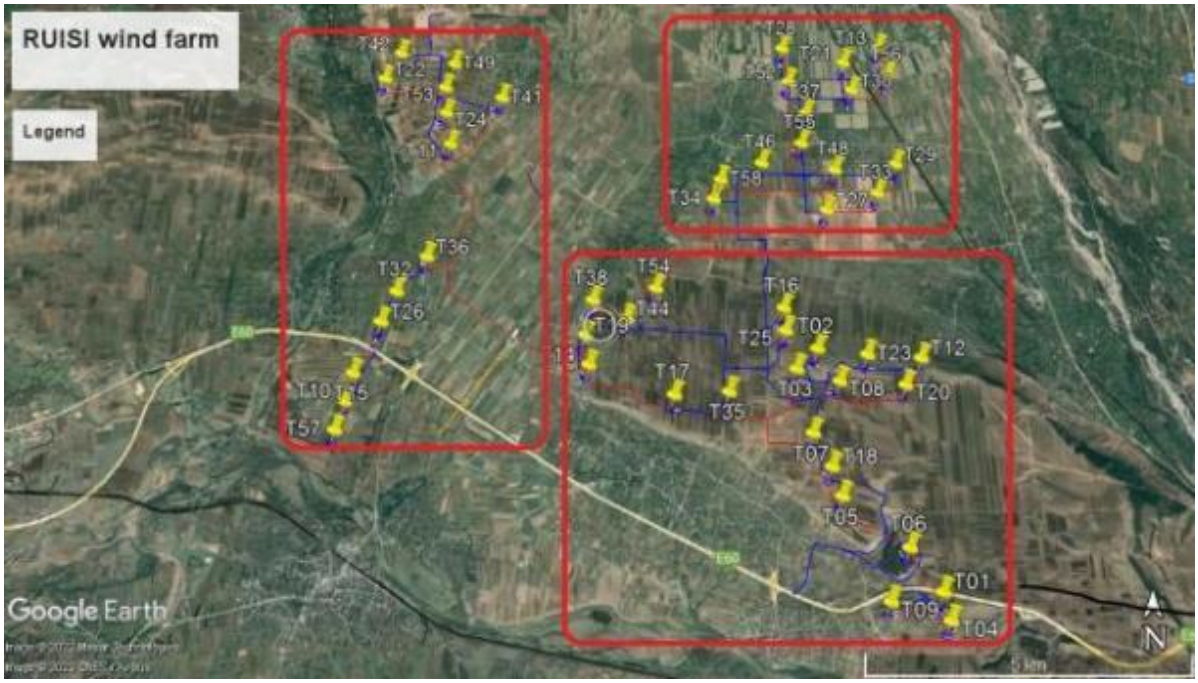
T49	409849.63	4661879.23	734 m.a.s.l.
T53	409818.23	4661413.98	727 m.a.s.l.
T42	408950.37	4662291.84	739 m.a.s.l.
T22	408830.02	4661593.34	731 m.a.s.l.
T10	408526.03	4655428.26	659 m.a.s.l.
T57	408342.73	4654941.27	655 m.a.s.l.
T15	408569	4655828	663 m.a.s.l.

Group II

T01	418021.3	4652219.65	608 m.a.s.l.
T02	416221.89	4656151.42	815 m.a.s.l.
T03	416147.68	4656021.81	820 m.a.s.l.
T04	418136.44	4651995.14	747 m.a.s.l.
T05	416479.04	4653661.11	744 m.a.s.l.
T06	417575.47	4652925.48	753 m.a.s.l.
T07	416151.06	4654791.76	775 m.a.s.l.
T08	416644.78	4655589.38	800 m.a.s.l.
T09	417196.77	4652107.02	709 m.a.s.l.
T12	418082.92	4656054.78	785 m.a.s.l.
T14	412463.1	4655938.91	732 m.a.s.l.
T16	415815.78	4656759.1	804 m.a.s.l.
T17	413908.31	4655479.39	860 m.a.s.l.
T18	416431.31	4654244.13	753 m.a.s.l.
T19	412427.78	4656529.69	725 m.a.s.l.
T20	417805.22	4656035.79	782 m.a.s.l.
T23	417153.32	4656074.71	805 m.a.s.l.
T25	415835.23	4656488.01	807 m.a.s.l.
T35	414815.84	4655492.83	750 m.a.s.l.
T38	412551.17	4657054.34	735 m.a.s.l.
T44	413118.58	4656858.28	730 m.a.s.l.
T54	413641	4657454.91	742 m.a.s.l.

Group III.

T34	414716	4659024	710 m.a.s.l.
T37	416476.95	4660728.90	721 m.a.s.l.
T58	4659453.81	414886.97	711 m.a.s.l.
T46	415656.27	4659501.34	710 m.a.s.l.
T48	416904.81	4659723.95	705 m.a.s.l.
T55	416251.55	4660097.52	711 m.a.s.l.
T29	418031.89	4659708.53	702 m.a.s.l.
T33	417651.41	4659044.98	705 m.a.s.l.
T27	416764.95	4658951.01	715 m.a.s.l.
T30	417420.26	4661246.77	714 m.a.s.l.
T52	416480.12	4660973.2	716 m.a.s.l.
T28	416485.99	4661282.21	720 m.a.s.l. ALT
T38	412522.23	4661414.32	717 m.a.s.l. ALT
T39	412917.56	4662251.69	730 m.a.s.l. ALT
T40	412744.92	4661817.23	724 m.a.s.l.
T56	418062.34	4661586.54	716 m.a.s.l.



Map 6. The Groups of WTG construction sites preselected for the field survey

The main methods used during the field surveys were a series of visual observations undertaken on foot at the construction sites of WTG and between them, direct observations in open and semi-open habitats (fields, gardens, pastures, artificial pine grove and windbreakers). Such signs of any mammal and other terrestrial vertebrates activity as footprints, droppings were registered. The following methods were used to fixate the signs of the small mammal (except bats) activity within the Project area: registration of burrows, footprints and animals droppings, visual finds during the surveys on foot etc. The presence of moles ware determined by the presence of molehills.

For the survey of amphibians and reptiles observations were conducted on the preliminary selected sites and its surroundings in the project area of Ruisi Wind Farm. The observations were performed by walking along the banks of small ponds, canals and rivers within the project area and impact zone. The direct visual observations of amphibians were conducted at all of the potential spawning sites close to wind turbines construction sites, counting the adult individuals and fixation of evidence of spawning (a lay of eggs etc) etc..

Specific attention had been paid to the collecting of data in the most sensitive areas and on the threatened species, which are included in the IUCN Red List, and are listed in the Red list of Georgia, 2006 as belonging to threatened categories (VU, EN, and CR).

6. Field data

6.3. Terrestrial vertebrate (Mammals, Amphibians and Reptileans) survey results within the limits of Ruisi Wind Farm

Turbine N06 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 7.**	T06 417575.47 4652925.48 753 m.a.s.l.
 **Picture 99. Fox hole in the coniferous grove**	Artificial forest with coniferous trees and shrubs **Animal species:** Red fox (*Vulpes vulpes*), Rodents.

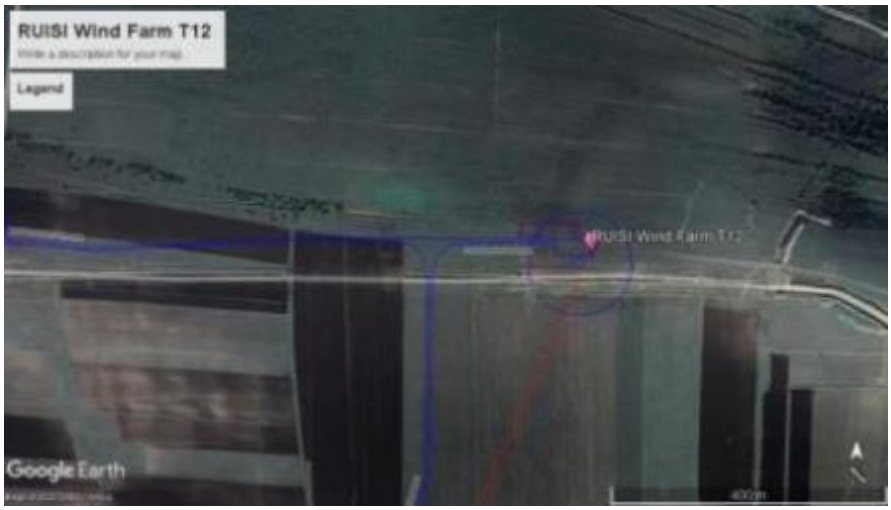
Turbine N05 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 8.**	T05 416479.04 4653661.11 744 m.a.s.l.
 **Picture 100.**	Agricultural land with sunflowers **Animal species:** Rodents.

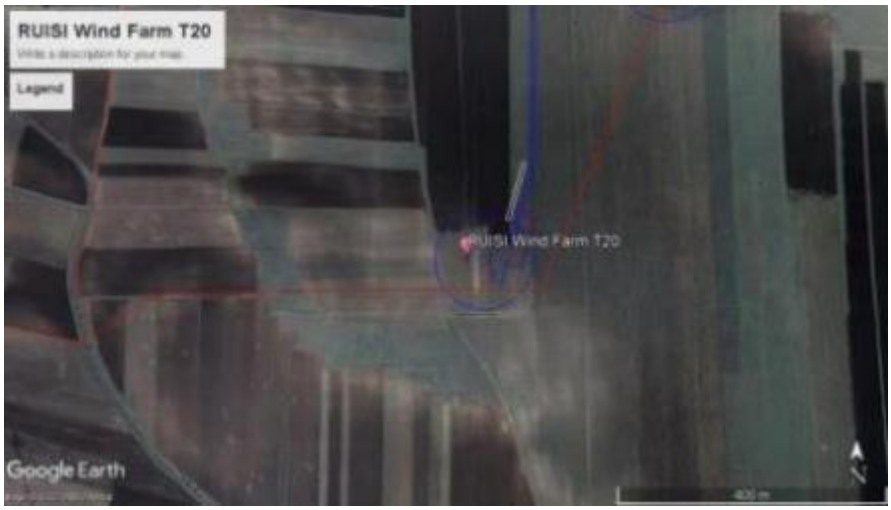
Turbine N18 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 9.**	T18 416431.31 4654244.13 753 m.a.s.l.
 **Picture 101.**	Agricultural land with sunflowers **Animal species:** Rodents.

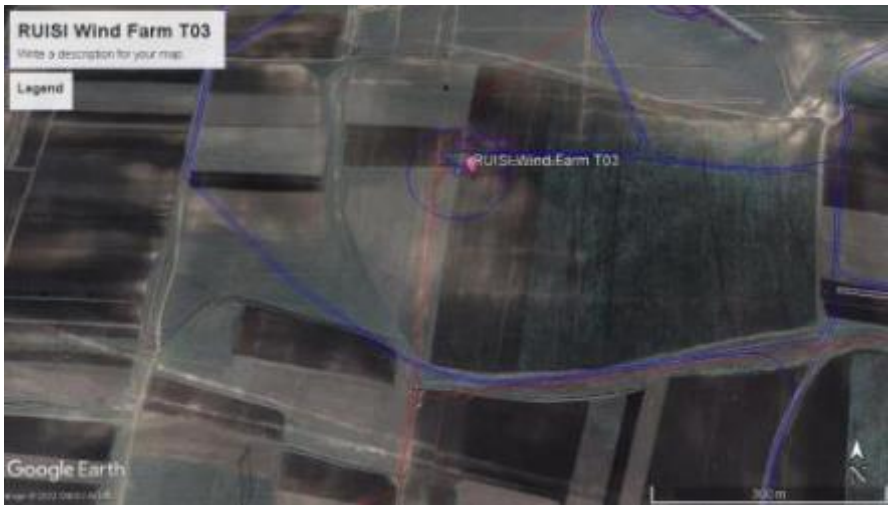
Turbine N07 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 10.**	T07 416151.06 4654791.76 775 m.a.s.l.
 **Picture 102.**	Agricultural land with beans **Animal species:** Rodents.

Turbine N08 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 11.**	T08 416644.78 4655589.38 800 m.a.s.l.
 **Picture 103.**	Agricultural land with wheat, already harvested **Animal species:** Rodents.

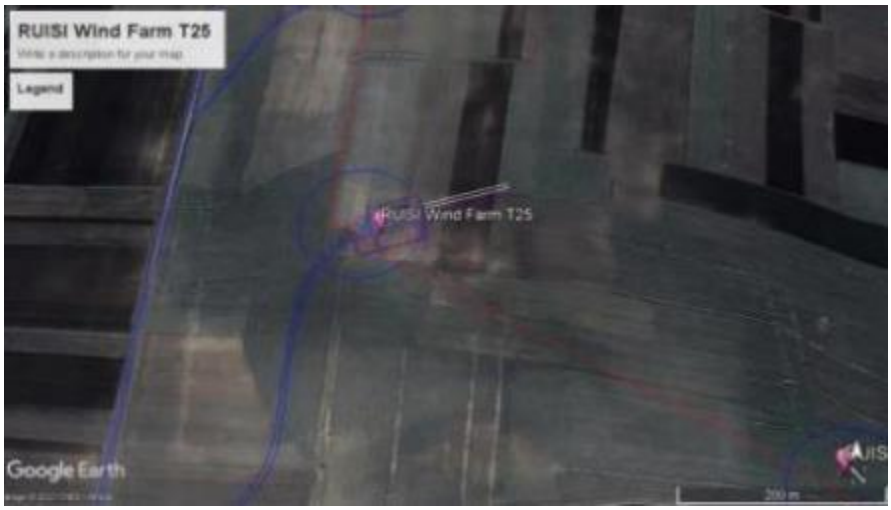
Turbine N23 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 12.**	T23 417153.32 4656074.71 805 m.a.s.l.
 **Picture 104.**	Pasture, degraded secondary meadow **Animal species:** Rodents.

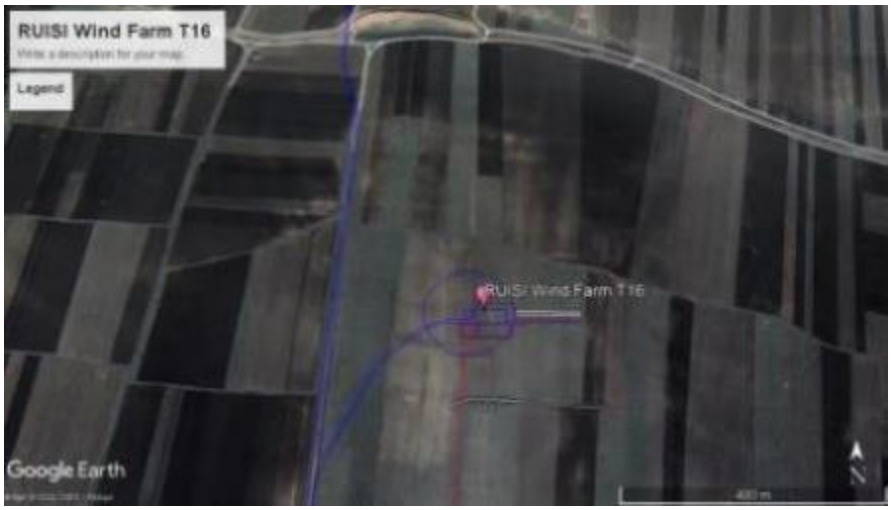
Turbine N12 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 13.**	T12 418082.92 4656054.78 785 m.a.s.l.
 **Picture 105.**	Pasture, degraded secondary meadow **Animal species:** Rodents.

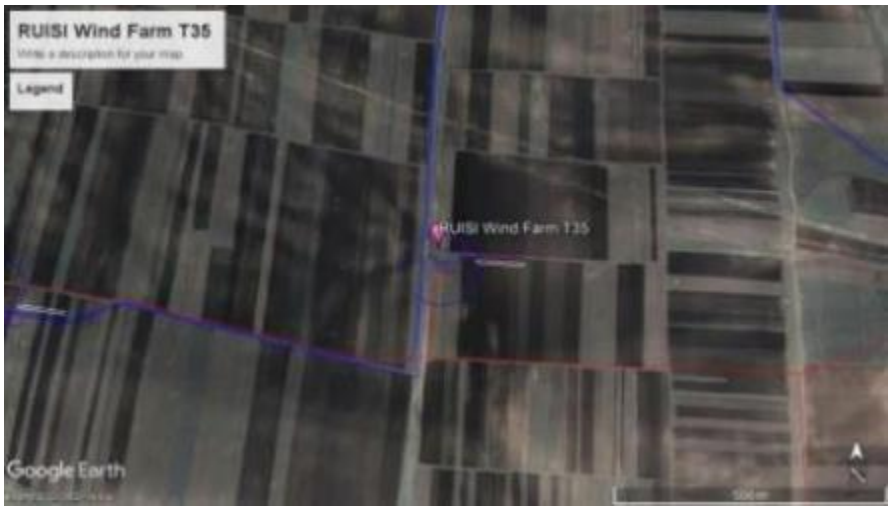
Turbine N20 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 14.**	T20 417805.22 4656035.79 782 m.a.s.l.
 **Picture 106.**	Agricultural land with wheat **Animal species:** Rodents.

Turbine N03 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 15.**	T03 416147.68 4656021.81 820 m.a.s.l.
 **Picture 107.**	Agricultural land with wheat **Animal species:** Rodents.

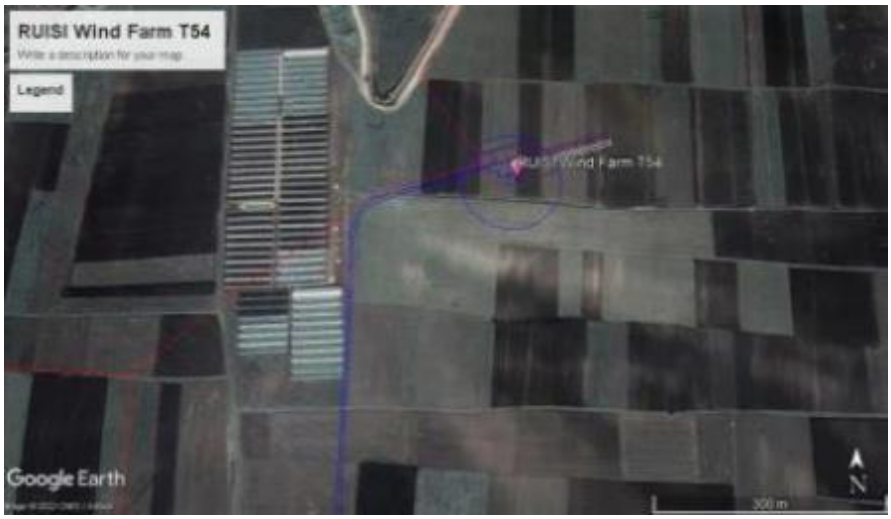
Turbine N02 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 16.**	T02 416221.89 4656151.42 815 m.a.s.l.
 **Picture 108.**	Pasture, degraded secondary meadow **Animal species:** Rodents.

Turbine N25 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 17.**	T25 415835.23 4656488.01 807 m.a.s.l.
 **Picture 109.**	Pasture, degraded secondary meadow **Animal species:** Rodents.

Turbine N16 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 18.**	T16 415815.78 4656759.1 804 m.a.s.l.
 **Picture 110.**	Pasture, degraded secondary meadow **Animal species:** Rodents.

Turbine N35 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 19.**	T35 414815.84 4655492.83 750 m.a.s.l.
 **Picture 111.**	Agricultural land with wheat and vegetables **Animal species:** Rodents.

Turbine N17 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 20.**	T17 413908.31 4655479.39 860 m.a.s.l.
 **Picture 112.**	Agricultural land with wheat **Animal species:** Rodents.

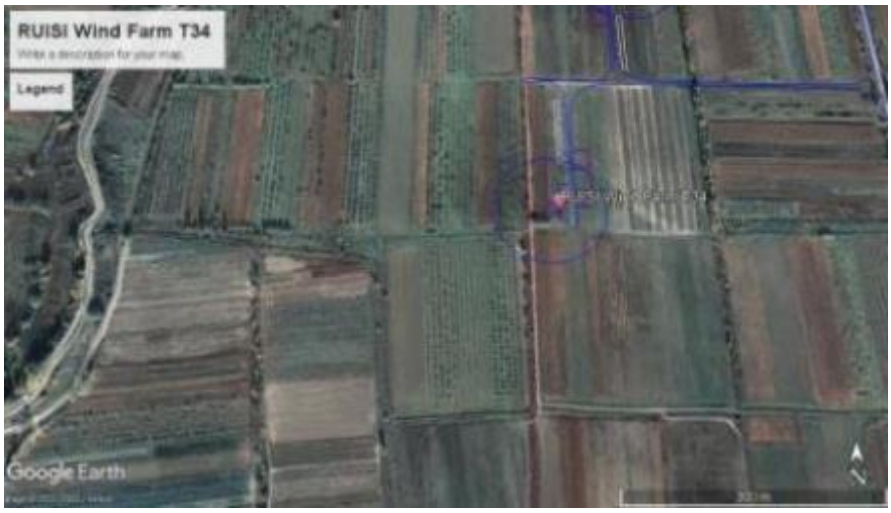
Turbine N54 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 21.**	T54 413641 4657454.91 742 m.a.s.l.
 **Picture 113.**	Agricultural land with wheat **Animal species:** Rodents.

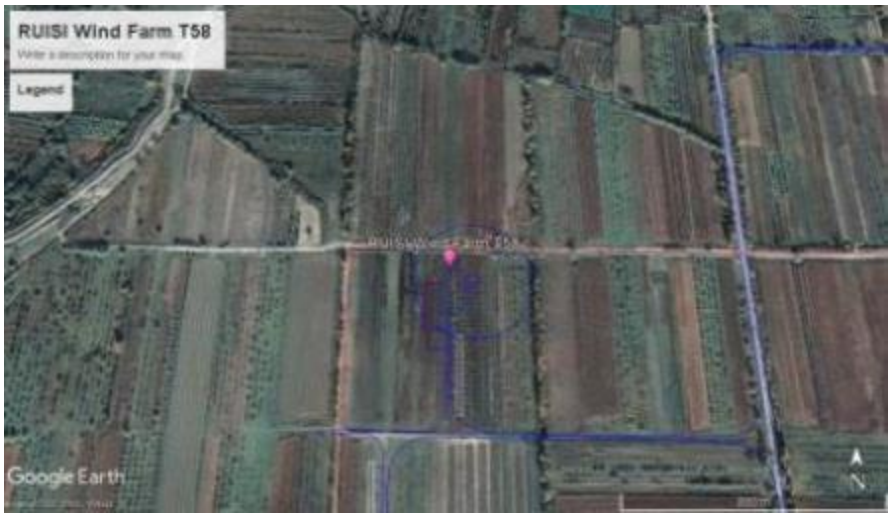
Turbine N44 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 22.**	T44 413118.58 4656858.28 730 m.a.s.l.
 **Picture 114.**	Agricultural land with wheat **Animal species:** Rodents.

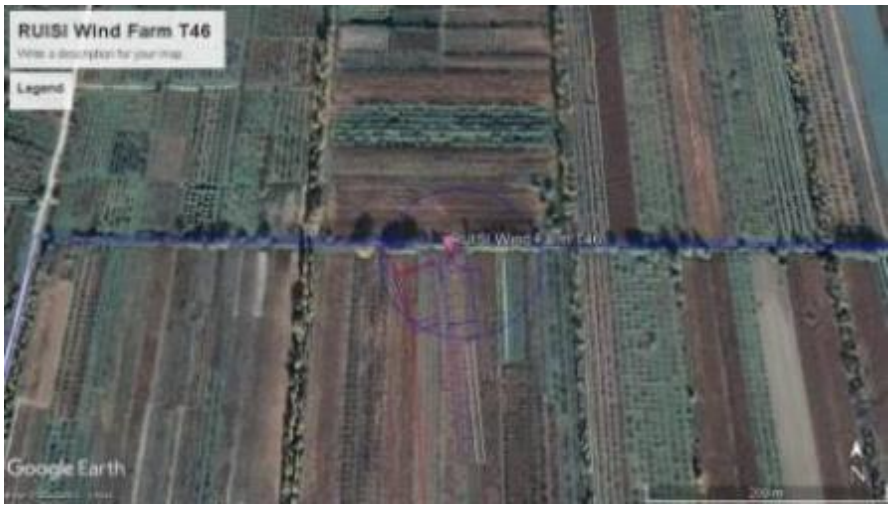
Turbine N38 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 23.**	T38 412551.17 4657054.34 735 m.a.s.l.
 **Picture 115.**	Agricultural land with vegetable **Animal species:** Rodents.

Turbine N19 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 24.**	T19 412427.78 4656529.69 725 m.a.s.l.
 **Picture 116.**	Agricultural land with vegetable **Animal species:** Rodents.

Turbine N14 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 25.**	T14 412463.1 4655938.91 732 m.a.s.l.
 **Picture 117.**	Agricultural land with onions **Animal species:** Rodents.

Turbine N34 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 26.**	T34 414716 4659024 710 m.a.s.l.
 **Picture 118.**	Agricultural land with corn **Animal species:** Rodents.

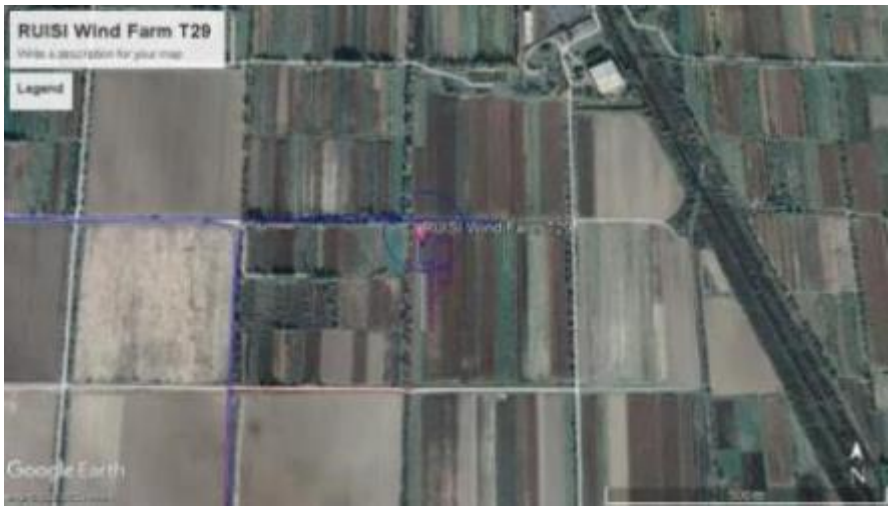
Turbine N58 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 27.**	T58 414886.97 4659453.81 711 m.a.s.l.
 **Picture 119.**	Apple orchard **Animal species:** Rodents, Red fox (*Vulpes vulpes*).

Turbine N46 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 28.**	T46 415656.27 4659501.34 710 m.a.s.l.
 **Picture 120.**	Agricultural land with corn **Animal species:** Rodents, Red fox (*Vulpes vulpes*).

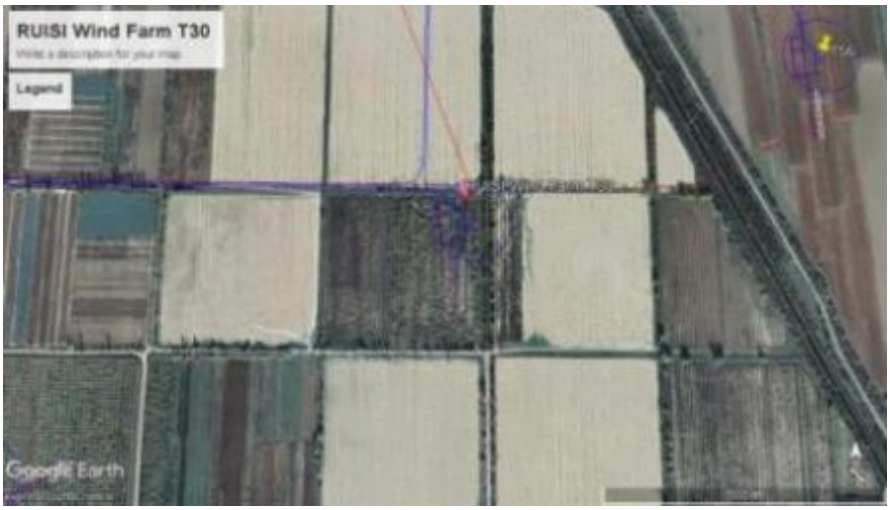
Turbine N27 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 29.**	T27 416764.95 4658951.01 715 m.a.s.l.
 **Picture 121.**	Agricultural land **Animal species:** Rodents.

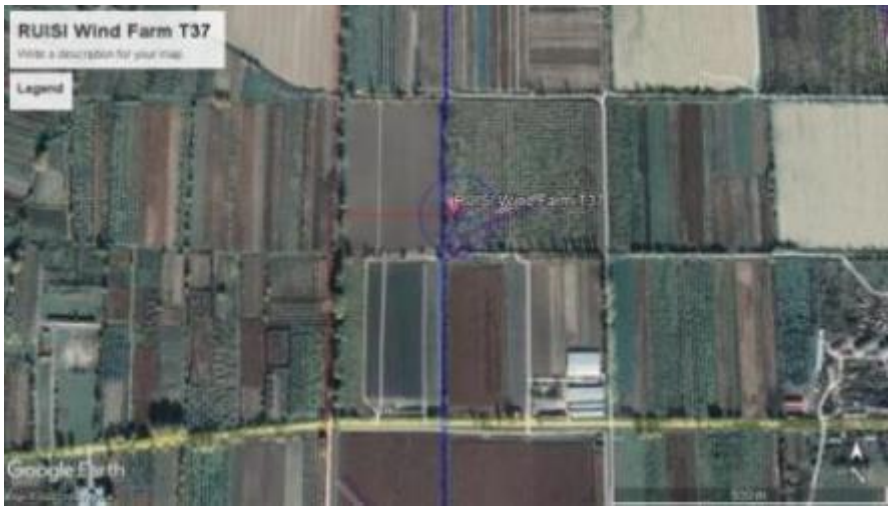
Turbine N55 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 30.**	T55 416251.55 4660097.52 711 m.a.s.l.
 **Picture 122.**	Agricultural land with corn Apple orchard **Animal species:** Rodents, Red fox (*Vulpes vulpes*).

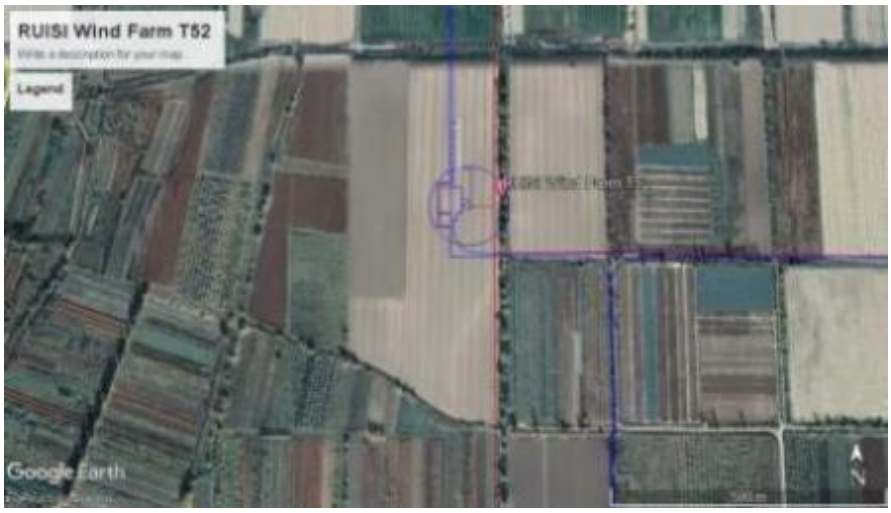
Turbine N48 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 31.**	T48 416904.81 4659723.95 705 m.a.s.l.
 **Picture 123.**	Apple orchard **Animal species:** Rodents, Red fox (*Vulpes vulpes*).

Turbine N29 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 32.**	T29 418031.89 4659708.53 702 m.a.s.l.
 **Picture 124.**	Agricultural land **Animal species:** Rodents.

Turbine N33 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 33.**	T33 417651.41 4659044.98 705 m.a.s.l.
 **Picture 125.**	Agricultural land with wheat **Animal species:** Rodents.

Turbine N30 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 34.**	T30 417420.26 4661246.77 714 m.a.s.l.
 **Picture 126.**	Orchard with white and black cherries **Animal species:** Rodents, Red fox (*Vulpes vulpes*).

Turbine N37 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 35.**	T37 416476.95 4660728.90 721 m.a.s.l.
 **Picture 127.**	Agricultural land with corn **Animal species:** Rodents, Red fox (*Vulpes vulpes*), Marsh Frog (*Pelophylax ridibundus*).

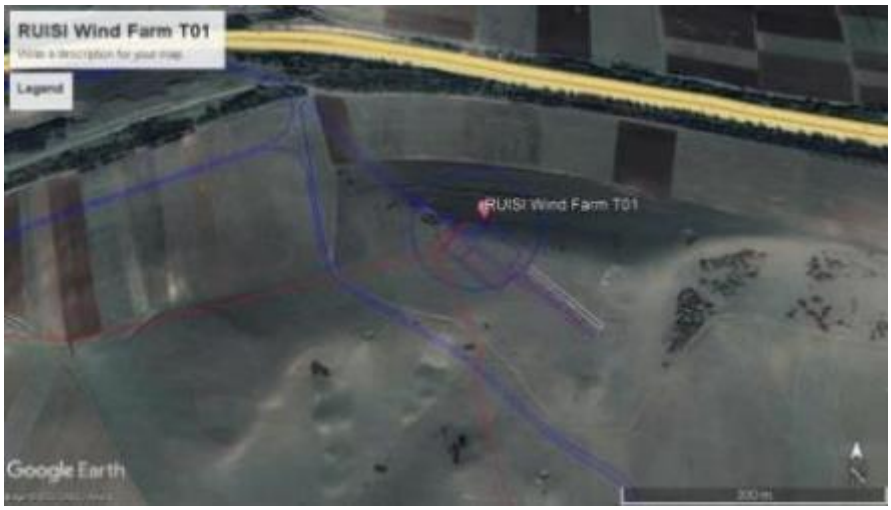
Turbine N52 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 36.**	T52 416480.12 4660973.2 716 m.a.s.l.
 **Picture 128.**	Agricultural land with wheat **Animal species:** Rodents, Red fox (*Vulpes vulpes*).

Turbine N40 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 37.**	T40 412744.92 4661817.23 724 m.a.s.l.
 **Picture 129.**	Agricultural land with cabbage **Animal species:** Rodents, Red fox (*Vulpes vulpes*), Marsh Frog (*Pelophylax ridibundus*).

Turbine N38 ALT construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 38.**	ALT. T38 412522.23 4661414.32 717 m.a.s.l.
 **Picture 130.**	Agricultural land with corn **Animal species:** Rodents, Red fox (*Vulpes vulpes*), Marsh Frog (*Pelophylax ridibundus*).

Turbine N39 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 39.**	ALT. T39 412917.56 4662251.69 730 m.a.s.l.
 **Picture 131.**	Agricultural land bordering with apple orchard **Animal species:** Rodents, Red fox (*Vulpes vulpes*), Marsh Frog (*Pelophylax ridibundus*).

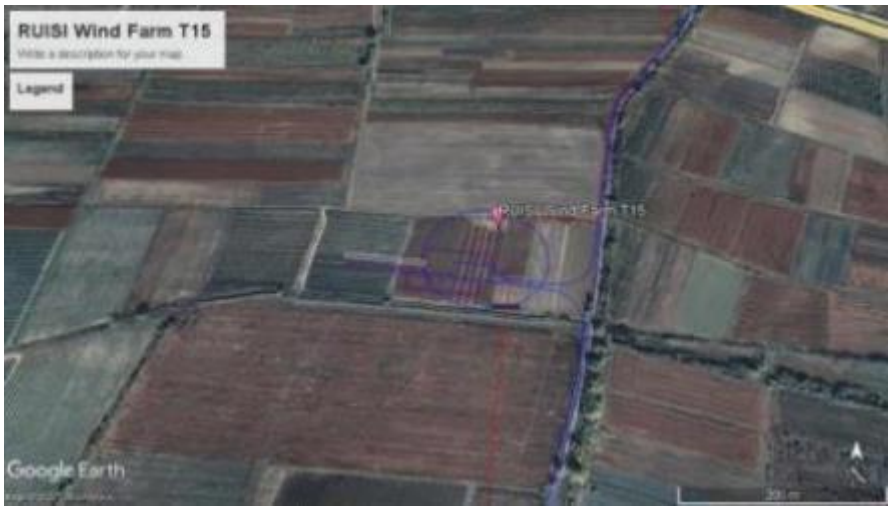
Turbine N09 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 40.**	T09 417196.77 4652107.02 709 m.a.s.l.
 **Picture 132.**	Secondary meadow with shrubs **Animal species:** Three-lined Lizard (*Lacerta media*).

Turbine N01 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 41.**	T01 418021.3 4652219.65 608 m.a.s.l.
 **Picture 133.**	Secondary meadow with shrubs **Animal species:** Not any species of terrestrial mammals except birds.

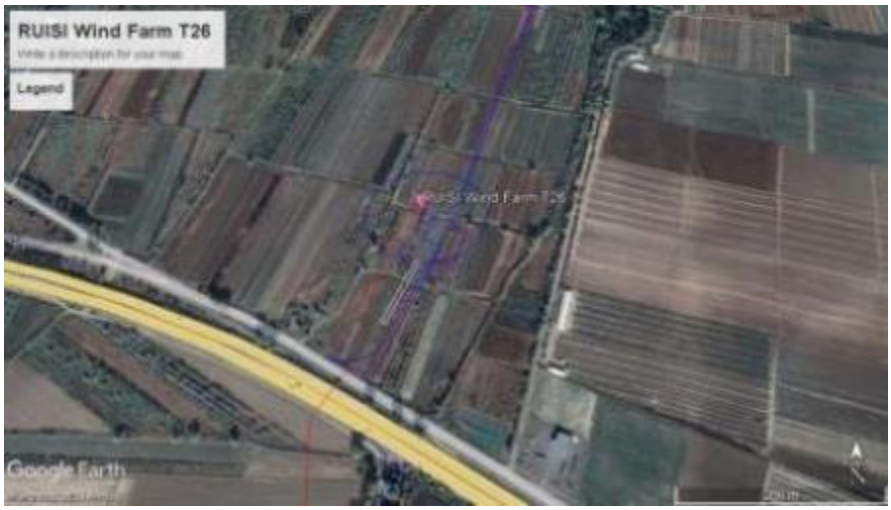
Turbine N04 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 42.**	T04 418136.44 4651995.14 747 m.a.s.l.
 **Picture 134.**	Secondary meadow with shrubs **Animal species:** Rodents, Three-lined Lizard (*Lacerta media*)

Turbine N10 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 43.**	T10 408526.03 4655428.26 659 m.a.s.l.
 **Picture 135.**	Apple orchard **Animal species:** Rodents, Red fox, (*Vulpes vulpes*), Marsh Frog (*Pelophylax ridibundus*), Grass snake (*Natrix natrix*), Schmidt's Whip Snake (*Dolichophis schmidti*).

Turbine N57 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 44.**	T57 408342.73 4654941.27 655 m.a.s.l.
 **Picture 136.**	Apple orchard **Animal species:** Rodents, Red fox, (*Vulpes vulpes*), Marsh Frog (*Pelophylax ridibundus*), Grass snake (*Natrix natrix*), Schmidt's Whip Snake (*Dolichophis schmidti*).

Turbine N15 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 45.**	T15 408569 4655828 663 m.a.s.l.
 **Picture 137.**	Agricultural land with corn **Animal species:** Rodents, Red fox, (*Vulpes vulpes*), Marsh Frog (*Pelophylax ridibundus*), Grass snake (*Natrix natrix*), Schmidt's Whip Snake (*Dolichophis schmidti*).

Turbines N10 and N15 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 46.**	Btween turbines N10 and N15 408614.22 4655644.01 668 m.a.s.l.
 **Picture 138.**	Agricultural land **Animal species:** Schmidt's Whip Snake (*Dolichophis schmidti*), the length of the registered individual is 105 cm.

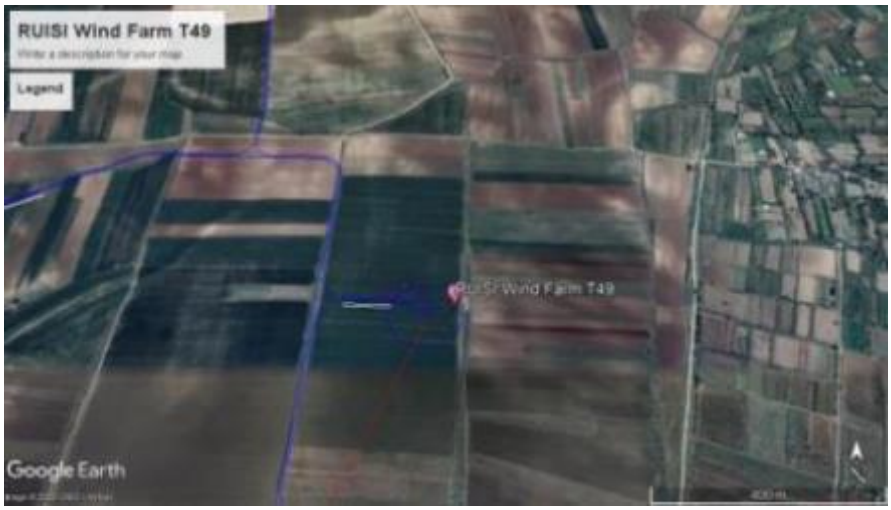
Turbine N26 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 47.**	T26 408928.3 4656841.26 672 m.a.s.l.
 **Picture 139.**	Agricultural field with vegetable **Animal species:** Rodents, Mole (*Talpa* sp.) Marsh Frog (*Pelophylax ridibundus*).

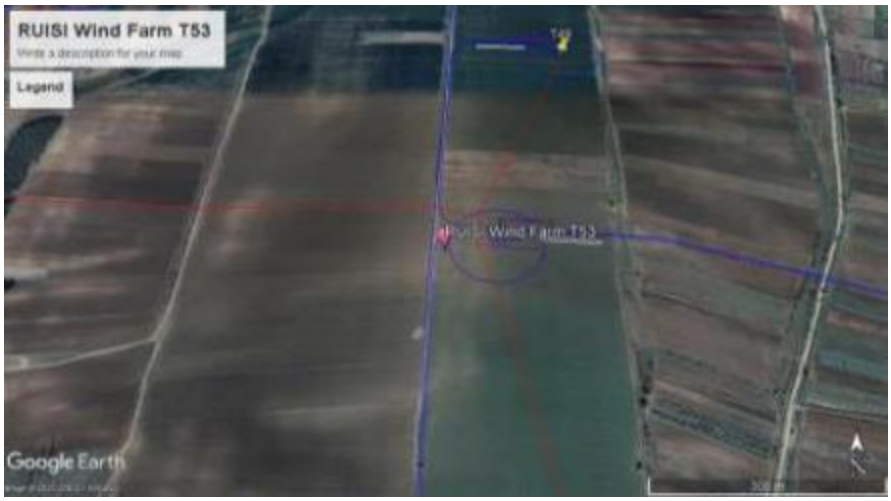
Turbine N32 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 48.**	T32 409213.08 4657236.94 676 m.a.s.l.
 **Picture 140.**	Agricultural field with wheat **Animal species:** Rodents, Red fox, (*Vulpes vulpes*), Marsh Frog (*Pelophylax ridibundus*), Mole (*Talpa* sp.)

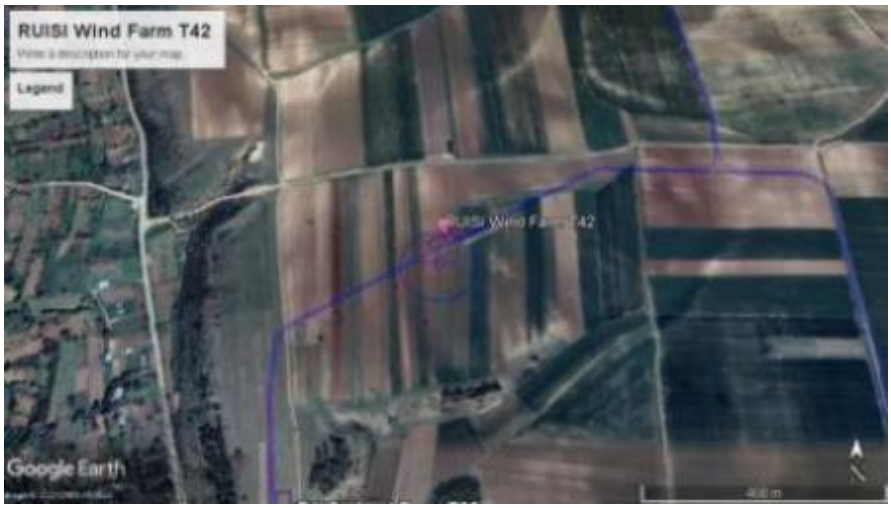
Turbine N36 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 49.**	T36 409755.5 4658002.31 682 m.a.s.l.
 **Picture 141.**	Agricultural fields with potatoes and peppers **Animal species:** Rodents, Marsh Frog (*Pelophylax ridibundus*).

Turbine N11 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 50.**	T11 410045.54 4660163.82 718 m.a.s.l.
 **Picture 142.**	Agricultural fields with corn **Animal species:** Rodents, Red fox, (*Vulpes vulpes*), Mole (*Talp*a sp.)

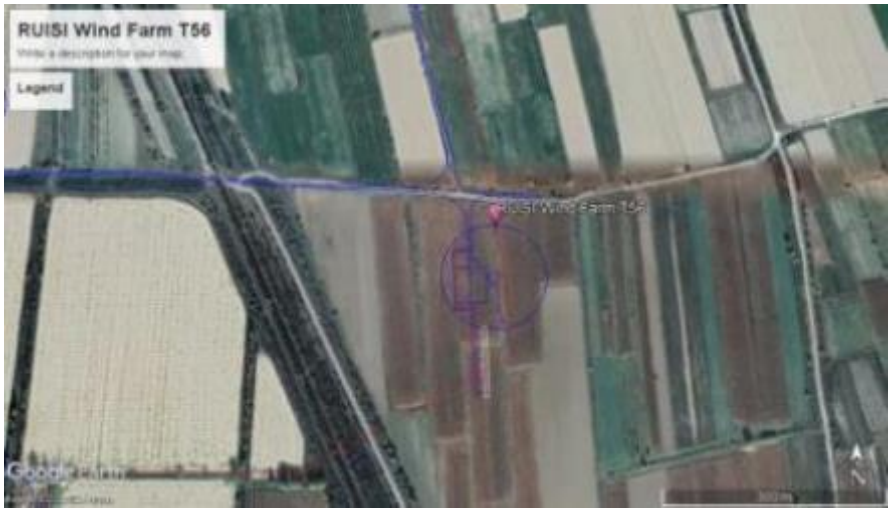
Turbine N41 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 51.**	T41 410623.03 4660956.01 723 m.a.s.l.
 **Picture 143.**	Secondary meadow **Animal species:** Rodents, Mole (*Talpa* sp.).

Turbine N49 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 52.**	T49 409849.63 4661879.23 734 m.a.s.l.
 **Picture 144.**	Agricultural land with wheat **Animal species:** Rodents, Red fox, (*Vulpes vulpes*), Marsh Frog (*Pelophylax ridibundus*), Mole (*Talpa* sp.)

Turbine N53 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 53.**	T53 409818.23 4661413.98 727 m.a.s.l.
 **Picture 145.**	Agricultural land with wheat **Animal species:** Rodents, Red fox, (*Vulpes vulpes*), Marsh Frog (*Pelophylax ridibundus*), Mole (*Talpa* sp.)

Turbine N42 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 54.**	T42 408950.37 4662291.84 739 m.a.s.l.
 **Picture 146.**	Agricultural land with wheat **Animal species:** Rodents.

Turbine N22 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 55.**	T22 408830.02 4661593.34 731 m.a.s.l.
 **Picture 147.**	Secondary meadow **Animal species:** Rodents.

Turbine N56 construction area **Map and picture of the survey area on the Ruisi Wind Farm territory**	**Habitat description, coordinates and animal species**
 **Map 56.**	T56 418062.34 4661586.54 716 m.a.s.l.
 **Picture 148.**	Agricultural field with vegetable **Animal species:** Rodents, Red fox, (*Vulpes vulpes*), Marsh Frog (*Pelophylax ridibundus*), Mole (*Talpa* sp.)

The construction area of the Ruisi WPP is of low significance from the terrestrial vertebrates conservation standpoint. The population of most of the terrestrial animals of the Ruisi Wind Farm Project Area can be classified as a poor in species number. Moreover there are presented mainly widely distributed, quite common and numerous species, which are typical elements to the fauna of this region of Georgia. The fauna in the Wind Farm construction territory is typical for the agricultural fields and degraded meadows. Mammalian species include Mole (*Talpa* sp.), Social Vole (*Microtus socialis*) and Red Fox (*Vulpes vulpes*). Reptiles are represented by: Mediterranean Tortoise (*Testudo graeca*), Three-lined Lizard (*Lacerta media*), Grass snake (*Natrix natrix*) and Schmidt's Whip Snake (*Dolichophis schmidti*). The most common amphibian species distributed in the project construction area is Eurasian Marsh Frog (*Pelophylax ridibundus*).

Only a small plots of habitats found within the project area can be considered as a sensitive from the standpoint of biodiversity protection. More-or-less significant for terrestrial animals should be considered the plots with artificial pine grove and windbreaks. Small fragments generally represent trees and shrubs in the studies area. All habitat types here have been exposed to strong anthropogenic influence over the centuries because of the people's need to seize larger areas of land for cultivation. Today, they exhibit different levels of degradation.

The Ruisi Wind Farm Project Area does not include any habitats of rare species of mammals, amphibians and reptiles included in the National "Georgia Red List, 2006"; There are no any Protected Areas of importance for the biodiversity protection within the limits of Ruisi Wind Farm Project Area (National Parks, nature reserves, managed reserves, nature monuments, etc.).

7 Major conclusions and recommendations to the responsible company on the construction of Ruisi Wind Farm based on the faunal review of the target territory

The identification and assessment of the biodiversity impact present at the construction area of the Ruisi wind farm was carried out considering the summarized impacts on the habitats and the fauna.
Based on the data collected by authors during field surveys carried out within the limits of Ruisi Wind Farm project area and adjacent territories as well as all available literature data, the faunistic importance of the Project territory should be considered in general as a low.
The environmental impacts may be temporary, thus primarily relating to the construction period, or they may be permanent relating to the operation period.
The most vulnerable group of organisms during the construction phase are small mammals. birds and reptiles.
The wires are difficult to be noticed, the birds are unable to react in a timely manner so they can very easily get killed if their wings touch the electricity-powered cables. There is high mortality rate among birds that migrate at night or during bad weather conditions such as fog, rain and low presence of clouds.

Negative impacts are generally expected during the construction phase of the Ruisi Wind Farm project due to the following:

- Generation of noise and vibration during the operation of the construction machinery, which will highly disturb the amphibians, birds and mammals;
- Use the explosives, resulting direct mortality (terrestrial animals) or indirect impacts such as noise disturbance;
- Large frequency of big vehicles and people presence during the construction of Ruisi Wind Farm will disturb the birds and other living organisms, especially during their mating season;
- Fragmentation of habitats and creation of edge effect which threatens biodiversity;
- Potential occurrence of new access roads that will destroy the existing ecosystems and cause of erosion;
- Pollution of the soil and the ground waters caused by the oil from vehicles and machinery, if they are not handled appropriately or in case of accidents;
- Various construction activities will results to generation of huge quantity of waste.

Recommendations need to be taken into consideration at stages of operation of the wind farms in the Ruisi Wind Farm area:

- The Wildlife Management Plan will be prepared for the Ruisi wind Farm project area;
- Areas used for disposing harmful substances must be kept at minimum. It is also necessary to organize adequate handling and storage;
- All locations that shall be used as temporary deposits for construction materials and resources should be initially identified and surveyed by zoologist in order to avoid the possible negative impact on the animals;

- The project area has to be provided with proper waste management facilities such as dust bins and earthen pits. After the construction all waste fuel, oils, lubricants etc. will be stored separately and given for relevant recycling use.
- Avoid the impact on the sites with ttree canopy – remains of windbreakers and articifial pine grove, that are the important habitat of animals.
- During the operation phase of the wind farms, to observe a bat and bird mortality rate caused by turbines. This observation will give an opportunity to reveal turbines with negative impacts on bats and birds, if such does exist. In case of identification of such turbines, additional recommendations will be developed for the site specific cut-in speed and functionality schedule (with indication of times when it is necessary to stop) in order to minimize their negative impacts on bats and birds;
- To drain artificial small-size stagnat waterbodies within the construction sites of each separate WTGs and its adjacent territories. This will decrease attractive areas for the insects, a pray of bats, and accordingly minimise the artificial feeding sites for bats. Ultimately, draining of the wetlands/swamps will minimize bats mortality cases might be potentially caused by turbines of the wind farm;
- To use a cold lighting directed to the land at both phases of construction and operation of the Ruisi Wind Farm;
- In order to reduce the mortality of the birds that migrate at night or during bad weather conditions that collide with the cables of the transmission line it is recommended to use Bird Flight Diverters.

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Annex – The list of fauna species occurring within the impact area of Ruisi Wind Farm Project

Table 1. Animal species, included in the Red Data List of Georgia (2006), which are occurring within the impact area of the Project.

Red Data List of Georgia and **IUCN Red Data List** categories: **NT** – Near Threatened, **VU** – Vulnerable, **EN** – Endangered; **CR** – Critical Endangered; **Status on territory** : **YR-R** - Year Round Resident, **SB** – Summer Breeder, SV – Summer Visitor, **PM** – Passage Migrant, **OV** – Occasional Visitor, **H** – home range of the species lies within the Project Impact area; **Confirmation status** – **DO** – Direct Observation during the field surveys, **PD** - recorded by the Passive Bat detector, **TO** – tracks or footprints observed during the field surveys, **L** – noted in scientific literature, I – data obtained in results of interview of colleagues and locals, **S** – presence is expected because of habitat requirement of the species known from published issues.

	Latin name	Georgian name	English name	Red Data List of Georgia	Assessment 2020	IUCN Red Data List	Convention	Emerald Network	Resolution #6	Status on territory	Confirmation status	CITES
	Mammalia	**ძუძუმწოვრები**										
1.	*Barbastella barbastellus*	ევროპული მაჩქათელა	Western Barbastelle	**VU**	**VU**	*NT*	EUROBATS	Yes	Yes	YRR	PD	
2.	*Nyctalus lasiopterus*	გიგანტური მელამურა	Giant Noctule		**VU**	**VU**	EUROBATS, Bern II			SV	PD	
3.	*Mesocricetus brandti*	ამიერკავკასიური ზაზუნა	Brandt's Hamster	**VU**	**VU**	*NT*				YR-R	DO	
4.	*Cricetulus migratorius*	ნაცრისფერი ზაზუნა	Grey Dwarf Hamster	**VU**	**VU**	LC				YR-R	L	
	Aves	**ფრინველები**										
1.	*Neophron percnopterus*	ფასკუნჯი	Egyptian Vulture	**VU**		**EN**				OV rare	L	
2.	*Aquila heliaca*	ბეგობის არწივი	Imperial Eagle	**VU**	**EN**	**VU**	Bern II	Yes	Yes	PM rare	L	I
3.	*Accipiter brevipes*	ქორცქვიტა	Levant Sparrowhawk	**VU**	LC	LC	Bern II	Yes	Yes	PM	DO	II
4.	*Buteo rufinus*	ველის კაკაჩა	Long-legged Buzzard	**VU**	LC	LC	Bern II	Yes	Yes	PM, YR-V	DO	II
5.	*Streptopelia turtur*	ჩვეულებრივი გვრიტი	European Turtle-dove		**EN**	**VU**				PM	DO	
6.	*Falco naumanni*	ველის კირკიტა	Lesser Kestrel	***CR***	***CR***	LC	Bern II	Yes	Yes	PM	L	II
	Reptilia	**ქვეწარმავლები**										
1.	*Testudo graeca*	ხმელთაშუაზღვის კუ	Mediterranean Tortoise	**VU**	*NT*	**VU**	Bern II	Yes	Yes	YR-R	L, I	II
	Osteichtyes	**ძვლოვანი თევზები**										
1.	*Barbus capito*	ჭანარი	Bulatmai barbel		**VU**	**VU**				YR-R	L	
2.	*Cyprinus carpio*	კობრი (გოჭა)	Common carp		**VU**	**VU**				YR-R	L	
3.	*Acanthobrama microlepis (former*	შავწარბა	Blackbrow bleak		**VU**	LC				YR-R	L	

	Latin name	Georgian name	English name	Red Data List of Georgia	Assessment 2020	IUCN Red Data List	Convention	Emerald Network	Resolution #6	Status on territory	Confirmation status	CITES
	Acanthalburnus microlepis)											
4.	*Chondrostoma cyri*	მტკვრის ტობი	Kura nase		**VU**	LC				YR-R	L	
5	*Sabanejewia aurata*	წინააზიური გველანა	Golden Spined Loach	**VU**		LC				YR-R	S	
	Insecta	**მწერები**										
1.	*Acherontia atrops (former Manduca atropos)*	სფინქსი მკვდართავა	Death's Head Sphinx	**EN**	NE	NE				SB	S	
2.	*Callimorpha dominula*	დათუნელა ჰერა	Scarlet Tiger Moth	**VU**	NE	NE				SB	S	
3.	*Polyommatus daphnis*	ცისფერა მელეაგრი	Meleager's Blue	**VU**	NE	LC				SB	S	
4.	*Xylocopa violacea*	იისფერი ქსილოკოპა	Violet Carpenter bee	**VU**	NE	LC				SB	S	

Table 2. Mammals occurring within the project area

Red Data List of Georgia and **IUCN Red Data List** categories: *NT* – Near Threatened, **VU** – Vulnerable, **EN** – Endangered; **CR** – Critical Endangered; **Status on territory** : **YR-R** - Year Round Resident, **SB** – Summer Breeder, **PM** – Passage Migrant, **YR-V -** Year Round Visitor**, OV** – Occasional Visitor, **H** – home range of the species lies within the Project Impact area, **F** – Feeding area; **Data Source and Presence Confirmation** – **DO** – Direct Observation during the field surveys, **USD** - recorded by the Ultrasound Bat detector, **T** – tracks or footprints observed during the field surveys, **L** – noted in scientific literature, **E** – presence is expected because of habitat requirement of the species known from published issues.

	Family	Latin name	Georgian Name	English name	Endemic	Red List of Georgia	2020 Assessment	IUCN Red Data List	CITES	Bern Convention Annex	Bonn Convention	Emerald Network Species	Resolution #6	Presence Status within Project area	Source
		ERINACEOMORPHA													
1.	*Erinaceidae*	*Erinaceus concolor*	აღმოსავლეთევროპული ზღარბი	Southern White-breasted Hedgehog			LC	LC						HR	DO
		SORICOMORPHA													
2.	*Soricidae*	*Crocidura suaveolens*	გრძელკუდა კბილთეთრა	Gueldenstaedt'sShrew			LC	LC		III				HR	L
3.		*Crocidura leucodon*	თეთრმუცელა კბილთეთრა	Bicoloured White-toothed Shrew			LC	LC		III		1	1	HR	L
4.	*Talpidae*	*Talpa levantis*	მცირე თხუნელა	Levant Mole	**?**		LC	LC						HR	T
		CHIROPTERA													
5.	*Rhinolophidae*	*Rhinolophus ferrumequinum*	დიდი ცხვირნალა	Greater Horseshoe Bat			LC	LC			EUROBATS	1	1	HR	DO
6.		*Rhinolophus hipposideros*	მცირე ცხვირნალა	Lesser Horseshoe Bat			LC	LC			EUROBATS	1	1	HR	L
7.	*Vespertilionidae*	*Barbastella barbastellus*	ევროპული მაჩქათელა	Western Barbastelle		**VU**	**VU**	*NT*			EUROBATS	1	1	SV	UBD
8.	Molosidae	*Tadarida teniotis*	გრძელკუდა ნაკეცტუჩა	European Free-tailed Bat			DD	LC						SV	UBD
9.		*Eptesicus serotinus*	ჩვეულებრივი მეგვიანე	Serotine			LC	LC		II	EUROBATS			SV	UBD
10.		*Myotis blythii*	ყურწვეტა მღამიობი	lesser mouse-eared bat			LC	LC		II	EUROBATS	1	1	SV	UBD
11.		*Myotis davidii*		Steppe Whiskered Bat			DD	LC			EUROBATS			?	UBD
12.		*Myotis mystacinus*	ულვაშა მღამიობი	Whiskered Myotis			LC	LC		II	EUROBATS			SV	UBD
13.		*Myotis nattereri*	ნატერერის მღამიობი	Natterer's Bat			DD	LC		II	EUROBATS			SV	UBD
14.		*Nyctalus leisleri*	მცირე მეღამურა	Lesser Noctule			LC	LC		II	EUROBATS			SV	UBD
15.		*Nyctalus noctula*	წითური მეღამურა	Noctule			LC	LC		II	EUROBATS			SV	UBD
16.		*Nyctalus lasiopterus*	გიგანტური მეღამურა	Giant Noctule			**VU**	**VU**		II	EUROBATS			SV	UBD
17.		*Pipistrellus nathusii*	ტყის ღამორი	Nathusius'Pipistrelle			LC	LC		II	EUROBATS			?	UBD
18.		*Pipistrellus kuhlii*	ხმელთაშუაზღვის ღამორი	Kuhl's Pipistrelle			LC	LC		II	EUROBATS			SV	UBD
19.		*Pipistrellus pipistrellus*	ჯუჯა ღამორი	Common Pipistrelle			LC	LC		III	EUROBATS			HR	UBD

	Family	Latin name	Georgian Name	English name	Endemic	Red List of Georgia	2020 Assessment	IUCN Red Data List	CITES	Bern Convention Annex	Bonn Convention	Emerald Network Species	Resolution #6	Presence Status within Project area	Source
20.		*Pipistrellus pygmaeus*	პაწია ღამორი	Pygmy Pipistrelle			LC	LC		II	EUROBATS			?	UBD
21.		*Plecotus auritus*	რუხი ყურა	Brown Long-eared Bat			LC	LC		II	EUROBATS			?	UBD
22.		*Vespertilio murinus*	ჩვეულებრივი ღამურა	Particoloured Bat			DD	LC			EUROBATS			SV	UBD
		LAGOMORPHA													
23.	*Leporidae*	*Lepus europaeus*	ევროპული კურდღელი	European Brown Hare			LC	LC						HR	L
		RODENTIA													
24.	*Gliridae*	*Glis glis*	ჩვეულებრივი ძილგუდა	Fat dormouse			LC	LC		III				HR	L
25.		*Dryomys nitedula*	ტყის ძილგუდა	Forest Dormouse			LC	LC		III				HR	L
26.	Cricetidae	*Microtus obscurus*	ჩვეულებრივი მემინდვრია	Common Vole			LC	LC						HR	L
27.		*Microtus socialis*	საზოგადოებრივი მემინდვრია	Social Vole			LC	LC						HR	DO
28.		*Mesocricetus brandti*	ამიერკავკასიური ზაზუნა	Brandt's Hamster	**?**	**VU**	**VU**	*NT*						HR	DO
29.		*Cricetulus migratorius*	ნაცრისფერი ზაზუნა	Grey Dwarf Hamster		**VU**	**VU**	LC						HR	L
30.	Muridae	*Mus musculus*	სახლის თაგვი	House Mouse			LC	LC						HR	DO
31.		*Mus macedonicus*	ველის თაგვი	Macedonian Mouse	**?**		LC	LC						HR	DO
32.		*Apodemus witherbyi*	კავკასიური ტყის თაგვი	Steppe mouse	**?**		LC	LC						HR	DO
33.		*Apodemus uralensis*	მცირე ტყის თაგვი	Little mouse			LC	LC						HR	L
34.		*Rattus norvegicus*	რუხი ვირთაგვა	Brown Rat			LC	LC						HR	L
35.		*Rattus rattus*	შავი ვირთაგვა	Black Rat			LC	LC						HR	L
		CARNIVORA													
36.	*Canidae*	*Canis aureus*	ტურა	Golden Jackal			LC	LC	III					HR	DO
37.		*Vulpes vulpes*	მელა	Red Fox			LC	LC	III					HR	T
38.	*Mustelidae*	*Martes foina*	კლდის კვერნა	Stone Marten, Beech Marten			LC	LC	III	III				HR	T
39.		*Meles meles*	მაჩვი	Eurasian Badger			LC	LC		III				HR	DO
40.		*Mustela nivalis*	დედოფალა	Least Weasel			LC	LC		III				HR	L
41.	*Felidae*	*Felis silvestris/F. catus*	ტყის კატა	Wild Cat			LC	LC	II	II				HR	DO
					4-?	**3 VU**	**4 VU**	**1VU**	**1-II, 3-III**	**12-II, 8-III**	**17-EUROBATS**	**5**	**5**	**25-HR, 11-SV, 4-?**	**10-DO, 12-L, 3-T, 16-USD**

Table 3. Birds occurring within the project area

The legend of the categories of the status of birds at the
YR-R: year-round resident; breeding species, present throughout of all seasons of the year;
YR-V: year-round visitor; non-breeding species, present throughout of all seasons of the year;
SB: Summer breeding birds – species present in summer and absent all the rest seasons;
WV: winter visitor – non-breeding species, present in late autumn, winter and early spring;
PM: passage visitor (transit migrant) – bird on passage, present primarily in autumn and spring;
OV: vagrant – recorded only several times; unexpected because normal distribution range is very distant from Georgia.

	Family	Latin name	Georgian Name	English name	Endemic	Red List of Georgia	2020 Assessment	IUCN Red Data List	CITES	Bern Convention	Bonn Convention (AEWA, Annex 2 - II)	Emerald Network	Resolution #6	Target species	Presence Status within Project area	Source
		GALLIFORMES														
1.	*Phasianidae*	*Coturnix coturnix*	მწყერი	Common Quail			LC	LC							SB, PM	DO
		ACCIPIRIFORMES														
2.	*Accipitridae*	*Pernis apivorus*	ბოლოკარკაზი	European Honey-buzzard			LC	LC	II	II		1	1	**1**	PM	DO
3.		*Circaetus gallicus*	გველიჭამია არწივი	Short-toed Snake-eagle			LC	LC	II	II		1	1	**1**	PM	DO
4.		*Aquila pomarina*	მცირე არწივი	Lesser Spotted Eagle			LC	LC	II	II		1	1	**1**	PM	DO
5.		*Hieraaetus pennatus*	ჩია არწივი	Booted Eagle			LC	LC	II	II		1	1	**1**	PM	DO
6.		*Aquila heliaca*	ბეგობის არწივი	Imperial Eagle		**VU**	**EN**	**VU**	I	II		1	1		PM r	L
7.		*Circus aeruginosus*	ჭაობის ბოლობეჭედა	Western Marsh-harrier			LC	LC	II	II		1	1	**1**	PM	DO
8.		*Circus cyaneus*	მინდვრის ბოლობეჭედა	Northern (Hen) Harrier			LC	LC	II	II		1	1	**1**	PM,WV	DO
9.		*Circus macrourus*	ველის ბოლობეჭედა	Pallid Harrier			*NT*	*NT*	II	II		1	1	**1**	PM	DO
10.		*Circus pygargus*	მდელოს ბოლობეჭედა	Montagu's Harrier			LC	LC	II	II		1	1	**1**	PM	DO
11.		*Accipiter brevipes*	ქორცქვიტა	Levant Sparrowhawk		**VU**	LC	LC	II	II		1	1		PM	DO
12.		*Accipiter nisus*	მიმინო	Eurasian Sparrowhawk			LC	LC	II	II				**1**	PM, WV,SV	DO
13.		*Accipiter gentilis*	ქორი	Northern Goshawk			LC	LC	II	II				**1**	PM, WV	DO
14.		*Milvus migrans*	ძერა	Black Kite			LC	LC	II	II		1	1	**1**	PM	DO
15.		*Buteo lagopus*	ფეხბანჯგვლიანი კაკაჩა	Rough-legged Buzzard			LC	LC	II	II				**1**	PM, WV	DO
16.		*Buteo buteo*	კაკაჩა	Common Buzzard			LC	LC	II	II				**1**	YR-V, PM, WV	DO
17.		*Buteo rufinus*	ველის კაკაჩა	Long-legged Buzzard		**VU**	LC	LC	II	II		1	1	**1**	YR-V, PM	DO
		COLUMBIFORMES														DO
18.	*Columbidae*	*Columba livia*	გარეული მტრედი	Rock Dove			LC	LC							YR-V	DO
19.		*Columba palumbus*	ქედანი	Common Woodpigeon			LC	LC		III					PM	DO
20.		*Streptopelia turtur*	ჩვეულებრივი გვრიტი	European Turtle-dove			**VU**	**VU**							PM	DO
21.		*Streptopelia decaocto*	საყელოიანი გვრიტი	Eurasian Collared-Dove			LC	LC							YR-R	DO
		CUCULIFORMES														DO

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22.	*Cuculidae*	*Cuculus canorus*	გუგული	Common Cuckoo			LC	LC							SB, PM	DO
		STRIGIFORMES														DO
23.	*Strigidae*	*Otus scops*	წყრომი	Common Scops-owl			LC	LC	II	II					SB, PM	DO
24.		*Athene noctua*	ჭოტი	Little Owl			LC	LC	II	II					YR-R	DO
25.		*Asio otus*	ყურებიანი ბუ	Long-eared Owl			LC	LC	II	II					YR-R	DO
		CAPRIMULGIFORMES														DO
26.	*Caprimulgidae*	*Caprimulgus europaeus*	უფეხურა	European Nightjar			LC	LC		II		1	1		SB, PM	DO
		APODIFORMES														DO
27.	*Apodidae*	*Apus apus*	ნამგალა	Common Swift			LC	LC							SB, PM	DO
		CORACIIFORMES														DO
28.	*Meropidae*	*Merops apiaster*	კვირიონი	European Bee-eater			LC	LC		II					SB, PM	DO
29.	*Coraciidae*	*Coracias garrulus*	ყაპყაპი	European Roller			LC	*NT*		II		1	1		PM	DO
30.	*Bucerotiformes*	*Upupa epops*	ოფოფი	Eurasian Hoopoe			LC	LC		II					SB, PM	DO
		PICIFORMES														DO
31.	*Picidae*	*Dendrocopos minor*	მცირე ჭრელი კოდალა	Lesser Spotted Woodpecker			LC	LC		II					YR-R	DO
32.		*Dendrocopos major*	დიდი ჭრელი კოდალა	Great Spotted Woodpecker			LC	LC		II					YR-R	DO
		FALCONIFORMES														DO
33.	*Falconidae*	*Falco naumanni*	ველის კირკიტა	Lesser Kestrel		***CR***	***CR***	LC	II	II		1	1	**1**	PM	DO
34.		*Falco tinnunculus*	ჩვეულებრივი კირკიტა	Common Kestrel			LC	LC	II	II				**1**	SV, PM	DO
35.		*Falco columbarius*	ალალი	Merlin			LC	LC	II	II			1		PM,WV	DO
36.		*Falco subbuteo*	მარჯანი	Eurasian Hobby			LC	LC	II	II				**1**	PM	DO
		PASSERIFORMES														DO
37.	*Laniidae*	*Lanius collurio*	ღაჟო	Red-backed Shrike			LC	LC		II		1	1		SB, PM	DO
38.		*Lanius minor*	შავშუბლა ღაჟო	Lesser Grey Shrike			LC	LC		II		1	1		SB, PM	DO
39.		*Lanius senator*	წითელთავა ღაჟო	Woodchat Shrike			LC	LC							SB	DO
40.	*Oriolidae*	*Oriolus oriolus*	მოლაღური	Eurasian Golden-oriole			LC	LC		II					SB, PM	DO
41.	*Corvidae*	*Garrulus glandarius*	ჩხიკვი	Eurasian Jay			LC	LC		III					YR-R	DO
42.		*Pica pica*	კაჭკაჭი	Black-billed Magpie			LC	LC		III					YR-R	DO
43.		*Corvus frugilegus*	ჭილყვავი	Rook			LC	LC		III					PM,WV	DO
44.		*Corvus cornix*	რუხი ყვავი	Hooded Crow			LC	LC							YR-R	DO
45.		*Corvus corax*	ყორანი	Common Raven			LC	LC							YR-R	DO
46.	*Alaudidae*	*Melanocorypha calandra*	ველის ტოროლა	Calandra Lark			LC	LC		II		1	1		SB, PM	DO
47.		*Calandrella brachydactyla*	მცირე ტოროლა	Greater Short-toed Lark			NE	LC		II		1	1		SB, PM	DO
48.		*Calandrella rufescens*	რუხი ტოროლა	Lesser Short-toed Lark			LC	LC		II					SB, PM	DO
49.		*Galerida cristata*	ქოჩორა ტოროლა	Crested Lark			LC	LC							SB, PM	DO

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50.		*Alauda arvensis*	მინდვრის ტოროლა	Eurasian Skylark			LC	LC							SB, PM	DO
51.		*Lullula arborea*	ტყის ტოროლა	Wood Lark			LC	LC				1	1		SB, PM	DO
52.	*Hirundinidae*	*Hirundo rustica*	სოფლის მერცხალი	Barn Swallow			LC	LC		II					SB, PM, SV	DO
53.		*Delichon urbica*	ქალაქის მერცხალი	Northern House-martin			LC	LC		II					SB, PM, SV	DO
54.	*Paridae*	*Parus major*	დიდი წივწივა	Great Tit			LC	LC		II					YR-R	DO
55.		*Parus caeruleus*	ლურჯთავა წიწკანა	Eurasian Blue Tit			LC	LC		II					YR-R	DO
56.	*Aegithalidae*	*Aegithalos caudatus*	თოხიტარა	Long-tailed Tit			LC	LC							YR-R	DO
57.	*Troglodytidae*	*Troglodytes troglodytes*	ჭინჭრაქა	Winter Wren			LC	LC		II			1		YR-R	DO
58.	*Phylloscopidae*	*Phylloscopus collybita*	ჭედია ყარანა	Common Chiffchaff			LC	LC		II					SB, PM	DO
59.		*Phylloscopus trochiloides*	მწვანე ყარანა	Greenish Warbler			LC	LC		II					PM	DO
60.	*Sylviidae*	*Sylvia atricapilla*	შავთავა ასპუჭაკა	Blackcap			LC	LC		II					SB, PM	DO
61.		*Sylvia communis*	რუხი ასპუჭაკა	Common Whitethroat			LC	LC		II					SB, PM	DO
62.	*Muscicapidae*	*Muscicapa striata*	რუხი მემატლია	Spotted Flycatcher			LC	LC		II					SB, PM	DO
63.		*Erithacus rubecula*	გულწითელა	European Robin			LC	LC		II					YR-R	DO
64.		*Ficedula semitorquata*	საყელოიანი მემატლია	Semicollared Flycatcher	?		LC	LC		II		1	1		PM	L
65.		*Phoenicurus phoenicurus*	ჩვეულებრივი ბოლოცეცხლა	Common Redstart			LC	LC		II					SB, PM	DO
66.		*Saxicola torquata*	შავთავა ოვსადი	Common Stonechat			LC	LC		II					SB, PM	DO
67.		*Saxicola rubetra*	მდელოს ოვსადი	Whinchat			LC	LC		II					SB, PM	DO
68.		*Oenanthe oenanthe*	ჩვეულებრივი მეღორღია	Northern Wheatear			LC	LC		II					PM	DO
69.		*Oenanthe pleschanka*	მელოტჩიტა	Pied Wheatear			LC	LC		II		1	1		SB, PM	DO
70.		*Oenanthe hispanica*	შავამლაყი მეღორღია	Black-eared Wheatear			LC	LC		II					SB, PM	DO
71.		*Oenanthe isabellina*	ბუქნია მეღორღია	Isabelline Wheatear			LC	LC		II					SB, PM	DO
72.	*Turdidae*	*Turdus merula*	შავი შაშვი	Eurasian Blackbird			LC	LC							YR-R	DO
73.		*Turdus pilaris*	ბოლოშავა	Fieldfare			LC	LC							PM, WV	DO
74.		*Turdus philomelos*	წრიპა	Song Thrush			LC	LC							SB? PM	DO
75.		*Turdus viscivorus*	ჩხართვი	Mistle Thrush			LC	LC							SB? PM, WV	DO
76.	*Sturnidae*	*Sturnus vulgaris*	შოშია	Common Starling			LC	LC		III					SB? PM, WV	DO
77.	*Motacillidae*	*Motacilla flava*	ყვითელი ბოლოქანქარა	Yellow Wagtail			LC	LC		II					PM	DO
78.		*Motacilla cinerea*	მთის ბოლოქანქარა	Grey Wagtail			LC	LC		II					PM	DO
79.		*Motacilla alba*	თეთრი ბოლოქანქარა	White Wagtail			LC	LC		II					YR-V, SB, PM	DO

	Family	Latin name	Georgian Name	English name	Endemic	Red List of Georgia	2020 Assessment	IUCN Red Data List	CITES	Bern Convention	Bonn Convention (AEWA, Annex 2 - II)	Emerald Network	Resolution #6	Target species	Presence Status within Project area	Source
80.		*Anthus campestris*	მინდვრის მწყერჩიტა	Tawny Pipit			LC	LC		II		1	1		SB, PM	DO
81.		*Anthus pratensis*	მდელოს მწყერჩიტა	Meadow Pipit			*NT*	*NT*		II					PM	L
82.		*Anthus trivialis*	ტყის მწყერჩიტა	Tree Pipit			LC	LC		II					SB, PM	DO
83.		*Anthus cervinus*	წითელჩიჩახვა მწყერჩიტა	Red-throated Pipit			LC	LC		II					PM	L
84.		*Anthus spinoletta*	მთის მწყერჩიტა	Water Pipit			LC	LC		II					PM, WV	DO
85.	*Emberizidae*	*Emberiza citrinella*	ჩვეულებრივი გრატა	Yellowhammer			LC	LC		II					PM	DO
86.		*Emberiza hortulana*	ბაღის გრატა	Ortolan Bunting			LC	LC				1	1		SB, PM	DO
87.		*Emberiza melanocephala*	შავთავა გრატა	Black-headed Bunting			LC	LC		II					SB, PM	DO
88.		*Emberiza calandra*	მეფეტვია	Corn Bunting			LC	LC							SB, PM	DO
89.	*Fringillidae*	*Fringilla coelebs*	სკვინჩა	Chaffinch			LC	LC							YR-R	DO
90.		*Fringilla montifringilla*	მთიულა	Brambling			LC	LC							PM, WV	DO
91.		*Chloris chloris*	მწვანულა	European Greenfinch			LC	LC		II					YR-R	DO
92.		*Carduelis carduelis*	ჩიტბატონა	European Goldfinch			LC	LC		II					YR-R, PM, WV	DO
93.		*Carduelis cannabina*	ჭვინტა	Eurasian Linnet			LC	LC		II					SB,PM	DO
94.	*Passeridae*	*Passer domesticus*	სახლის ბეღურა	House Sparrow			LC	LC		III					YR-R	DO
95.		*Passer montanus*	მინდვრის ბეღურა	Eurasian Tree Sparrow			LC	LC							YR-R	DO
96.		*Petronia petronia*	კლდის ბეღურა	Rock Sparrow			LC	LC							YR-R	DO
					1-?	**3-VU, 1-CR**	**1-CR, 1-EN,1-VU**	**2-VU**	**1-I, 22-II**	**67-II, 6-III**		**24**	**26**	**17**	**22-YR-R, 5-YR-V, 35-SB, 74-PM, 14-WV, 7-SV, 1-OV**	**92-DO, 4-L**

Table 3 4. Reptiles occurring within the project area

	Family	Genera	Georgian Name	English name	Endemic	Red List of Georgia	2020 Assessment	IUCN Red list	CITES	Bern Convention	Bonn Convention	Emerald Network Species	Resolution #6	Presence Status within Project area	Source
		SQUAMATA													
1.	Lacertidae	*Lacerta strigata*	ზოლიანი ხვლიკი	Striped Lizard			LC	LC		III				HR	**L**
2.		*Lacerta media*	საშუალო ხვლიკი	Three-lined Lizard			LC	LC						HR	**DO**

	Family	Genera	Georgian Name	English name	Endemic	Red List of Georgia	2020 Assessment	IUCN Red list	CITES	Bern Convention	Bonn Convention	Emerald Network Species	Resolution #6	Presence Status within Project area	Source
3.	Colubridae	*Platyceps najadum*	წენგოსფერი მცურავი	Dahl's Wipe Snake			LC	LC		II				HR	**L**
4.		*Coronella austriaca*	სპილენძა	Smooth Snake			LC	LC		II				HR	**L**
5.		*Dolichophis schmidti*	წითელმუცელა მცურავი	Red-Bellied Racer			LC	LC		III				HR	**DO**
6.		*Natrix natrix*	ჩვეულიბრივი ანკარა	Ring Snake, Grass Snake			LC	LC		III				HR	**DO**
7.		*Natrix tessellata*	წყლის ანკარა	Dice Snake			LC	LC						HR	**L**
8.	Typhlopidae	*Xerotyphlops vermicularis*	ბრუცა გველი	Eurasian Blind Snake			LC	LC		III				HR	**L**
		TESTUDINES													
9.	Testudinae	*Testudo graeca*	ხმელთაშუაზღვის კუ	Mediterranean Tortoise		**VU**	*NT*	**VU**	II	II		**1**	**1**	HR	**L**
						1-VU	**1-NT**	**1-VU**	**1-II**	**3-II, 4-III**		**1**	**1**	**9-HR**	**3-DO, 6-L**

Table 4 5. Amphibians occurring within the project area

	Family	Latin name	Georgian Name	English name	Endemic	Red List of Georgia	2020 Assessment	IUCN Red list	CITES	Bern Convention	Bonn Convention	Emerald Network	Resolution #6	Presence Status within Project area	Source of Data
		ANURA													
1	Bufonidae	*Bufotes variabilis (former Bufo viridis)*	მწვანე გომბეშო	European Green Toad			LC	DD		II				HR	DO
2	Hylidae	*Hyla orientalis*	აღმოსავლური ვასაკა	Shelkovnikov's treefrog			LC	NE		II				HR	DO
3	Ranidae	*Pelophylax ridibundus*	ტბორის ბაყაყი	Marsh frog			LC	LC						HR	DO
										2-II				**3-HR**	**3-DO**

Table 5 6. Fish species occurring within the project area

#	Family	*Latin name*	*Latin name by old classification*	Georgian Name	English name	Endemic	Red List of Georgia	2020 Assessment	IUCN Red list	CITES	Bern Convention	Bonn Convention	Emerald Network Species	Resolution #6	Mtkvar, Liakhvi, Prone	Canals, ponds	ISSUES
		CYPRINIFORMES															
1.	Cyprinidae	*Squalius cephalus*	*Leuciscus cephalus orientalis*	კავკასიური ქაშაპი	European chub				LC						**1**		L
2.		*Barbus lacerta*	*Barbus lacerta cyri*	მტკვრის წვერა	Kura barbel				LC						**1**		L
3.		*Barbus capito*	*Barbus capito*	ჭანარი	Bulatmai barbel			**VU**	**VU**					**1**	**1**		L
4.		*Barbus mursa*		მურწა	Mursa	Y			LC						**1**		L
5.		*Capoeta capoeta*	*Varicorhinus capoeta*	ხრამული	Khramulya				LC						**1**		L
6.		*Carassius carassius*		ჩვეულებრივი კარჩხანა	Crucian carp				LC						**1**	**1 ?**	L
7.		*Cyprinus carpio*		კობრი (გოჭა)	Common carp			**VU**	**VU**						**1**		L
8.		*Romanogobio persus*	*Gobio persa*	მტკვრის ციმორი	Kura gudgeon	Y		*NE*	*NE*						**1**		L
9.		*Alburnoides bipunctatus*		სამხრეთული ფრიტა	South minnow				LC						**1**		L
10.		*Alburnus filippii*		მტკვრის თაღლითა	Kura bleak	Y			LC						**1**	**1**	L
11.		*Acanthalburnus microlepis*		შავწარბა	Blackbrow bleak	Y		**VU**							**1**	**1**	L
12.		*Chondrostoma cyri*		მტკვრის ტობი	Kura nase	Y		**VU**	LC						**1**		L
13.	Cobitidae	*Sabanejewia aurata*	*Cobitis aurata*	წინააზიური გველანა	Golden Spined Loach		**VU**		LC		III			**1**	1		L
14.	Gobiidae	*Planticola cyris*	*Neogobius constructor*	კავკასიური მდინარის ღორჯო	Caucasian freshwater goby	Y			LC						**1**		L
15.	Nemacheilidae	*Oxynoemacheilus brandtii*	*Nemachilus brandti*	მტკვრის გოჭალა	Kura loach	Y			LC						**1**	1	L
		CYPRINODONTIFORMES															
16.	*Poeciliidae*	*Gambusia affinis / G.holbrooki*		გამბუზია	Mosquito fish			Lc	LC						**0**	**1**	L
		PERCIFORMES															
17.	Gobiidae	*Planticola cyris*	*Neogobius constructor*	კავკასიური მდინარის ღორჯო	Caucasian freshwater goby	Y		LC	LC						**1**	**1**	L
						8	**1**	**1- VU**	**2 VU**		**1**	**0**	**0**	**2**	**16**	**5+1?**	**17-L**

Annex 4. Bat Survey Reports

Assessment of Potential Impact on *Chiroptera* from the Construction and Operation of Wind Power Plant close to villages - Sagholasheni, Breti, Dzlevidjhvari, Sakasheti, Sasireti and Ruisi in Kareli Municipality

Report
(*March-October 2022*)

Ioseb Natradze

Experts participated in the research: Alexander Bukhnikashvili, Andrei Kandaurov and Giorgi Sheklashvili

November 2022

Table of contents

1. Introduction

It is planned to build a wind power plant close to villages Sagholasheni, Breti, Dzlevidjhvari, Sakasheti, Sasireti and Ruisi in Kareli Municipality within the coordinates 42.04109°N/43.88183°E, 42.11177°N/43.89318°E and 42.10780°N/ 44.01710°E, 42.00846°N/ 44.01355°E. Considering the fact that wind power plants have an impact caused by collision and/or barotrauma on bats living within/close to construction/target areas, the relevant research was planned with the following two main goals:

- Assessment of impact of the wind power plants construction on the *Chiroptera* (bats) occurred in the target area and its vicinity.
- Assessment of importance of the study area for the *Chiroptera*.

The study was divided into three phases with the following particular objectives:

1. Spring observations covering the period from March through the end of May. The main objective is to assess the extent to which the target area is used by bats for seasonal movements in spring.

2. Summer observations covering the period from June through the first decade of August. The main objective is to identify: a) bat species diversity of the target area, b) existence of maternity colonies within the target area and in the caves and/or other potential shelters found within a 2-4 km corridor from the target area; c) whether the target area is used by bats as feeding territory.

3. Autumn observations covering the period from the end of August through October. The main objective is to assess whether bats use the target area for swarming and/or seasonal movements.

Five passive bat detectors were installed in the project area from the beginning of March. Considering weather conditions active field surveys were started on 05.04.2022 and finished on 02.11.2022.

2. Methodology

The Agreement on the Conservation of Populations of European Bats (EUROBATS) under the Convention on Migratory Species (CMS) provides the special „Guidelines for consideration of bats in wind farm projects" (2014). The guidelines give recommendations about methods to use for the assessment of potential impact from the wind farms construction/operation on the bat species found in the target area and its vicinity. Considering the fact that these guidelines have been developed for whole Europe, it is recommended to adapt the given methods to local conditions of the target country and/or territory.

In the spring 2022, taking into account recommendations provided by „Guidelines for consideration of bats in wind farm projects (2014)" and considering weather conditions, during the field-surveys we focused on field-routes until 9th of May. This approach gave us an opportunity to make/cover with the field-routes the whole project area during three nights (Annex 1, Map #1). Field routs for the first night is given in red color (16.4km), field routes for the second night is given in purple color (19km), and field routes for the third night is given in white color (16.04km). Field research started before sunset and finished at the lowest rate of bats activity when we were not able to record bats activity during recent 2 hours and/or after 4-6 hours from sunset, and/or when the whole project area was covered by field routes. Additionally, we kept recommended10-day interval between field surveys.

From 19 May 2022, each field-survey visit included four nights (one night mist-nets and field routes in adjacent areas where mist-nets were installed and three nights of field routes covering the whole project area twice during each night). We are following recommended 14-day interval between each visit to the project area. During surveys the bats observation started 30 minutes before the sunset and continued throughout the night finishing 30 minutes after the sunrise. Before starting the observation wit mist nets, the relevant study polygons were selected within the target site. Mist nets were installed on the selected study polygons and field-routes conducted within the study area and its vicinities. The mist nets were installed on

the areas where relatively higher possibility of bats catching exists. The field-routs are conducted around the potential sites of wind power plants.

From 24 September 2022, during the field-surveys, we focused on field-routes and each field-survey visit included three nights of field routes covering the whole project area. Field research started 30 minutes ahead of sunset and finished at the lowest rate of bats activity when we were not able to record bats activity during recent 2 hours. The field-works were finished at the earliest after 4-6 hours from sunset.

It should be mentioned that those areas where at least two species and/or several individuals are recorded simultaneously are considered as the areas with relatively high bat activity.

The following equipment were used during the field observations - digital cameras Nikon Coolpix p900 and Canon SX50, ultrasound bat detectors Pettersson D240 and Pettersson D240x and also, special Ecotone bat nets. Bat sounds were recorded using portable voice recorders - Sony ICD-1000 and TASCAM DR-07MKII. For identification of the bat species, recorded sounds were processed by Kaleidoscope pro software.

In addition to the methodology described above, the guidelines recommend installing passive bat detectors on the target areas, which has been done for this particular project area. It is possible to identify bats species diversity and to define bat activity during the year or/and different seasons through data recorded by the passive bat detectors. The bat activity is estimated by bat activity indices. The bat activity index (BAI) is estimated as a number of bat sounds recorded within the certain time period (e.g. a night, a month, a season) divided by that time period. The BAI shows the importance of the target area for bats. Generally, the number of bat contacts can only be compared between species that have calls of similar intensity. However, a detectability coefficient has been calculated and applying this coefficient per species allows to compare number of bat contacts and consequently, BAI between bat species.

Generally, in case of worsening weather conditions during our fieldworks, observations would pause and the team would wait on the selected site until the improvement of weather conditions. Also, the survey schedule was adapted according to the weather conditions ensuring recommended 10-14 days interval between each field visit.

3. Description of the target area

The study area is located on the Shida-Kartli lowland in Eastern Georgia. The lowland is surrounded by low hill strips. Average altitude of project area is within 200-800 m asl. Project area mainly represents anthropogenic agricultural territories (Annex 3. Pictures #10-#30).

Literature data about bats of the study area do not exist. There are limited data about bats in the vicinity of the study area (Bukhnikashvili 2004, Бухникашвили и др. 2004,). These literature data give a general background about bats composition in the study area and its vicinity.

According to the available literature data and considering types of existing habitats, the following bat species might occur in the study area and its vicinities in different seasons of the year (Table 1).

Table 1

#	**Scientific name**	**Common name**	**Status**
1.	*Rhinolophus ferrumequinum*	Greater Horseshoe Bat	Bern convention, Annex 6 priority species
2.	*Rhinolophus hipposideros*	Lesser Horseshoe Bat	Bern convention, Annex 6 priority species
3.	*Myotis blythii*	Lesser Mouse-eared Bat	Bern convention, Annex 6 priority species
4.	*Myotis mystacinus*	Whiskered Bat	
5.	*Myotis davidii*	Steppe Whiskered Bat	

#	Scientific name	Common name	Status
6.	*Myotis emarginatus*	Geoffroy's Bat	
7.	*Myotis nattereri*	Natterer's Bat	
8.	*Pipistrellus pipistrellus*	Common Pipistrelle Bat	
9.	*Pipistrellus pygmaeus*	Soprano Pipistrelle	
10.	*Pipistrellus nathusii*	Nathusius' Pipistrelle Bat	
11.	*Pipistrellus kuhlii*	Kuhl's pipistrelle bat	
12.	*Barbastella barbastellus*	Western Barbastelle	Georgian Red List (GRL)
13.	*Nyctalus noctula*	Noctule	
14.	*Nyctalus leisleri*	Leisler's Bat	
15.	*Nyctalus lasiopterus*	Greater Noctule Bat	IUCN Red list species with category - VU
16.	*Vespertilio murinus*	Particoloured Bat	
17.	*Eptesicus serotinus*	Serotine Bat	
18.	*Plecotus auritus*	Brown Big-eared Bat	
19.	*Tadarida teniotis*	European free-tailed bat	

4. Field Study and Results

Considering weather conditions, active field surveys were started from 05.04.2022 (Annex 3. Pictures #1, #7, #8, #9, #31, #34). The given report covers both - data from the field surveys conducted from 05.04.2022 through 02.11.2022 and results of processing of acoustic data recorded by passive bat detectors from 30.03.2022 through 05.11.2022.

Should be highlighted that potential locations of most wind turbines (WT) are in the agricultural lands. Parts of those agricultural lands are fenced. Thus, it was not possible to directly access all exact locations during the field routes and accordingly, the field routes were conducted as close to the potential location of wind turbines as it was feasible.

The 05/04 night - the conducted field survey covered the red-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E; were conducted. Total length of the field routes 16.4km. No bats activity was recorded.

The 06/04 night – the conducted field survey covered the purple-colored field routes shown on Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates 42.04673°N/43.95865°E; were conducted. Total length of the field routes 19km. No bats activity was recorded.

The 07/04 night – the conducted field survey covered the white-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates 42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates 42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates 42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates

42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Total length of the field routes 16.04 km. No bats activity was recorded.

The 17/04 night - the conducted field survey covered the red-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E; were conducted. Total length of the field routes 16.4km. Places with relatively high bat activity were not recorded. In total, 41 bat acoustic contacts were recorded.

Species recorded on the 17th of April:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 34 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 7 contacts

The 18/04 night – the conducted field survey covered the purple-colored field routes shown on Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates 42.04673°N/43.95865°E; were conducted. Total length of the field routes 19km. No bats activity was recorded.

The 19/04 night – the conducted field survey covered the white-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates 42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates 42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates 42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates 42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Total length of the field routes 16.04 km. Places with relatively high bat activity were not recorded. In total, 11 bat acoustic contacts were recorded.

Species recorded on the 19th of April:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 11 contacts

The 27/04 night - the conducted field survey covered the red-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E; were conducted. Total length of the field routes 16.4km. Relatively high bat activity was recorded on the coordinates 42.1007°N/43.98775°E (Annex 1, Map#3, Act1) and 42.08796°N/43.98729°E (Annex 1, Map#3, Act2). In total, 75 bat acoustic contacts were recorded.

Species recorded on the 27th of April:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 58 contacts
2. Serotine Bat (*Eptesicus serotinus*) – 7 contacts
3. Noctule (*Nyctalus sp*) – 5 contacts

4. Mouse-eared Bat (*Myotis sp*) – 3 contacts
5. Bat – 2 contacts

The 28/04 night – the conducted field survey covered the purple-colored field routes shown on Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates 42.04673°N/43.95865°E; were conducted. Total length of the field routes 19km. Relatively high bat activity was recorded on the coordinates 42.01647°N/43.99702°E (Annex 1, Map#3, Act3). In total, 138 bat acoustic contacts were recorded.

Species recorded on the 28th of April:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 46 contacts
2. Soprano Pipistrelle (*Pipistrellus pygmaeus*) - 1 contacts
3. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 35 contacts
4. Serotine Bat (*Eptesicus serotinus*) – 3 contacts
5. Particoloured Bat (*Vespertilio murinus*) – 19 contacts
6. Noctule (*Nyctalus sp*) – 26 contacts
7. Mouse-eared Bat (*Myotis sp*) – 3 contacts
8. Bat – 5 contacts

The 29/04 night – the conducted field survey covered the white-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates 42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates 42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates 42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates 42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Total length of the field routes 16.04km. Places with relatively high bat activity were not recorded. In total, 67 bat acoustic contacts were recorded.

Species recorded on the 29th of April:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 49 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 14 contacts
3. Noctule (*Nyctalus sp*) – 4 contacts

The 07/05 night - the conducted field survey covered the red-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E; were conducted. Total length of the field routes 16.4km. Places with relatively high bat activity were not recorded. No bats activity was recorded.

The 08/05 night – the conducted field survey covered the purple-colored field routes shown on Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates

42.04673°N/43.95865°E; were conducted. Total length of the field routes 19km. No bats activity was recorded.

The 09/05 night – the conducted field survey covered the white-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates 42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates 42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates 42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates 42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Total length of the field routes 16.04km. Places with relatively high bat activity were not recorded. In total, 1 bat acoustic contact was recorded.

Species recorded on the 9th of May:

1. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 1 contact

Generally, on 7th, 8th, and 9th of May there were unfavorable weather conditions. Our team spent nights on the location waiting for improving weather conditions to work.

The 19/05 night - the conducted field survey covered the red-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E; were conducted. Due to the unfavorable weather conditions, we were not able to conduct field routes two times in the night. Team was waiting for the relevant weather conditions on the site during the whole night. Total length of the field routes 16.4km. Places with relatively high bat activity were not recorded. In total, 1 bat acoustic contacts were recorded.

Species recorded on the 19th of May:

1. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 1 contacts

The 20/05 night – the conducted field survey covered the purple-colored field routes shown on Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates 42.04673°N/43.95865°E; were conducted. Total length of the field routes 19km. Places with relatively high bat activity were not recorded. In total, 1 bat acoustic contacts were recorded.

Species recorded on the 20th of May:

1. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 1 contacts

The 23/05 night – the conducted field survey covered the white-colored field routes shown Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates 42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates 42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates 42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates 42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Due to the unfavorable weather conditions, we were not able to conduct field routes two times in the night. Team was waiting for the relevant weather conditions on the site during the whole night. No bats were recorded**.**

The 24/05 night – One 6m mist net was installed on the coordinates 42.072830°N/43.961678°E (Annex 1, Map#2, NET1; Annex 3, Pic.2). No Bats were caught. In total, 34 bat acoustic contacts were recorded on the adjustment areas of the mist net.

Species recorded on the 24th of May:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 22 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 12 contacts

The 06/06 night - the conducted field survey covered the red-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E were conducted. Total length of the field routes 32.8km. Relatively high bat activity was recorded between the coordinates 42.10338°N/43.96160°E Annex 1, Map#3, Act4)- 42.10089°N/43.96107°E (Annex 1, Map#3, Act5) In total, 177+ bat acoustic contacts were recorded.

Species recorded on the 6th of June:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 149+ contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 15 contacts
3. Serotine Bat (*Eptesicus serotinus*) – 11 contacts
4. Noctule (*Nyctalus sp*) – 2 contacts

The 07/06 night – the conducted field survey covered the purple-colored field routes shown Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates 42.04673°N/43.95865°E; were conducted. Total length of the field routes 38km. Places with relatively high bat activity were not recorded. In total, 46 bat acoustic contacts were recorded.

Species recorded on the 7th of June:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 25 contacts
2. Soprano Pipistrelle (*Pipistrellus pygmaeus*) - 1 contacts
3. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 13 contacts
4. Noctule (*Nyctalus sp*) – 6 contacts
5. Mouse-eared Bat (*Myotis sp*) – 1 contacts

The 08/06 night – the conducted field survey covered the white-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates 42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates 42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates 42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates 42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Total length of the field routes 32.08km. Places with relatively high bat activity were not recorded. In total, 91+ bat acoustic contacts were recorded**.**

Species recorded on the 8th of June:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 69 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 14+ contacts
3. Serotine Bat (*Eptesicus serotinus*) – 1 contact

4. Particoloured Bat (*Vespertilio murinus*) – 19 contacts
5. Noctule (*Nyctalus sp*) – 7 contacts

The 09/06 night – One 9m mist net was installed on the coordinates 42.11057°N/43.88459°E (Annex 1, Map#2, NET2; Annex 3, Pic.3). Study area was leftovers of riparian forest on the river Prone. No Bats were caught. In total, 62 bat acoustic contacts were recorded on the adjustment areas of the mist net.

Species recorded:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 54 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 8 contacts

The 19/06 night - the conducted field survey covered the red-colored field routes Annex 1 - Map#1. Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E were conducted. Total length of the field routes 32.8km. Relatively high bat activity was recorded close to the coordinates 42.10338°N/43.96160°E Annex 1, Map#3, Act4); 42.10089°N/43.96107°E (Annex 1, Map#3, Act5); 42.08508°N/43.9873°E (Annex 1, Map#3, Act6); 42.07993°N/43.9616°E (Annex 1, Map#3, Act7); 42.08347°N/ 43.9873°E (Annex 1, Map#3, Act12); 42.0825°N/ 43.97506°E (Annex 1, Map#3, Act13). In total, 282+ bat acoustic contacts were recorded.

Species recorded on the 19th of June:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 197+ contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 45 contacts
3. Serotine Bat (*Eptesicus serotinus*) – 5 contacts
4. Particoloured Bat (*Vespertilio murinus*) – 18 contacts
5. Noctule (*Nyctalus sp*) – 10 contacts
6. Mouse-eared Bat (*Myotis sp*) – 5 contacts
7. Bat – 2 contacts

The 20/06 night – the conducted field survey covered the purple-colored field routes shown on Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates 42.04673°N/43.95865°E; were conducted. Total length of the field routes 38km. Places with relatively high bat activity were not recorded. In total, 35 bat acoustic contacts were recorded.

Species recorded on the 20th of June:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 7 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 25 contacts
3. Serotine Bat (*Eptesicus serotinus*) – 3 contacts

The 21/06 night – One 18m mist net was installed on the coordinates 42.09737°N/43.90045°E (Annex 1, Map#2, NET3; Annex 3, Pic.4). Study area was an artificial pine forest. No Bats were caught. In total, 8 bat acoustic contacts were recorded on the adjustment areas of the mist net.

Species recorded:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 8 contacts

The 23/06 night – the conducted field survey covered the white-colored field routes shown Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates 42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates

42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates 42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates 42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Total length of the field routes 32.08km. Places with relatively high bat activity were not recorded. In total, 88 bat acoustic contacts were recorded**.**

Species recorded on the 23rd of June:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 57 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 22 contacts
3. Serotine Bat (*Eptesicus serotinus*) – 5 contacts
4. Noctule (*Nyctalus sp*) – 3 contacts
5. Bats – 1 contact

The 04/07 night - the conducted field survey covered the red-colored field routes shown Annex 1 - Map#1. Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E were conducted. Total length of the field routes 32.8km. Relatively high bat activity was recorded close to the coordinates 42.0786°N/44.00025°E (Annex 1, Map#3, Act9); 42.08796°N/43.98729°E (Annex 1, Map#3, Act2); 42.08347°N/43.9873°E (Annex 1, Map#3, Act12); 42.0825°N/ 43.97506°E (Annex 1, Map#3, Act13); 42.09737°N/43.98747°E (Annex 1, Map#3, Act10); 42.09644°N/ 43.9875°E (Annex 1, Map#3, Act11). In total, 170+ bat acoustic contacts were recorded.

Species recorded on the 4th of July:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 100+ contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 17 contacts
3. Serotine Bat (*Eptesicus serotinus*) – 10 contacts
4. Particoloured Bat (*Vespertilio murinus*) – 5 contacts
5. European free-tailed bat (*Tadarida teniotis*) – 1 contact
6. Noctule (*Nyctalus sp*) – 2 contacts
7. Mouse-eared Bat (*Myotis sp*) – 33 contacts
8. Bat – 2 contacts

The 05/07 night – One 12m mist net was installed on the coordinates 42.02533°N/44.00353°E (Annex 1, Map#2, NET4; Annex 3, Pic.5). Study area was artificial pine forest. No Bats were caught. In total, 20 bat acoustic contacts were recorded on the adjustment areas of the mist net.

Species recorded:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 20 contacts

The 06/07 night – the conducted field survey covered the purple-colored field routes shown on Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates 42.04673°N/43.95865°E; were conducted. Total length of the field routes 38km. Places with relatively high bat activity were not recorded. In total, 33 bat acoustic contacts were recorded.

Species recorded on the 6h of July:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 10 contacts

2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 18 contacts
3. Particoloured Bat (*Vespertilio murinus*) – 2 contacts
4. Noctule (*Nyctalus sp*) – 1 contact
5. Bats – 2 contacts

The 07/07 night – the conducted field survey covered the white-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates 42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates 42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates 42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates 42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Total length of the field routes 32.08km. Places with relatively high bat activity were not recorded. In total, 30+ bat acoustic contacts were recorded**.**

Species recorded on the 7th of July:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 25+ contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 4 contacts
3. European free-tailed bat (*Tadarida teniotis*) – 1 contact

The 19/07 night - the conducted field survey covered the red-colored field routes shown on Annex 1 - Map#1). Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E were conducted. Total length of the field routes 32.8km. Relatively high bat activity was recorded close to the coordinates 42.09801°N/43.96091°E (Annex 1, Map#3, Act14); In total, 195+ bat acoustic contacts were recorded.

Species recorded on the 19th of July:

1. Common Pipistrelle Bat (Pipistrellus pipistrellus) – 99+ contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 21 contacts
3. Serotine Bat (*Eptesicus serotinus*) – 27 contacts
4. Particoloured Bat (*Vespertilio murinus*) – 15 contacts
5. European free-tailed bat (*Tadarida teniotis*) – 1 contact
6. Noctule (*Nyctalus sp*) – 25 contacts
7. Mouse-eared Bat (*Myotis sp*) – 5 contacts
8. Bat – 2 contacts

The 20/07 night – the conducted field survey covered the purple-colored field routes shown on Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates 42.04673°N/43.95865°E; were conducted. Total length of the field routes 38km. Places with relatively high bat activity were not recorded. In total, 30 bat acoustic contacts were recorded.

Species recorded on the 204th of July:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 3 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 14 contacts
3. Mouse-eared Bat (*Myotis sp*) – 13 contacts

The 21/07 night - the conducted field survey covered the white-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates 42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates 42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates 42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates 42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Total length of the field routes 32.08km. Places with relatively high bat activity were not recorded. In total, 58 bat acoustic contacts were recorded**.**

Species recorded on the 21st of July:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 55 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 2 contacts
3. Mouse-eared Bat (*Myotis sp*) – 1 contacts

The 22/07 night – One 12m mist net was installed on the coordinates 42.07666°N/43.96186°E (Annex 1, Map#2, NET5; Annex 3, Pic.6). No Bats were caught, but during all study time, there were contacts of Common Pipistrelle Bat (*Pipistrellus pipistrellus*) and Serotine Bat (*Eptesicus serotinus*).

The 01/08 night - the conducted field survey covered the red-colored field routes shown on Annex 1 - Map#1). Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E were conducted. Total length of the field routes 33.7km. Relatively high bat activity was recorded close to the coordinates 42.08510°N/ 44.00106°E; (Annex 1, Map#3, Act8); 42.10646°N/44.00098°E(Annex 1, Map#3, Act17); 42.10916°N/44.00132°E(Annex 1, Map#3, Act18); 42.10134°N/44.00917°E (Annex 1, Map#3, Act19) In total, 191++ bat acoustic contacts were recorded.

Species recorded on the 1 of August:

1. Common Pipistrelle Bat (Pipistrellus pipistrellus) – 144+ contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 33 contacts
3. Serotine Bat (*Eptesicus serotinus*) – 3 contacts
4. Particoloured Bat (*Vespertilio murinus*) – 2 contacts
5. Mouse-eared Bat (*Myotis sp*) – 8 contacts
6. Bat – 1 contact

The 02/08 night – the conducted field survey covered the purple-colored field routes shown on Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates 42.04673°N/43.95865°E; were conducted. Total length of the field routes 38km. Places with relatively high bat activity were not recorded. In total, 24 bat acoustic contacts were recorded.

Species recorded on the 2 of August:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 19 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 2 contacts
3. Particoloured Bat (*Vespertilio murinus*) – 3 contacts

The 03/08 night - the conducted field survey covered the white-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates

42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates 42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates 42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates 42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Total length of the field routes 32.08km. Relatively high bat activity was recorded close to the coordinates: 42.06827°N/43.90830°E; (Annex 1. Map #3, Act15); 42.0674°N/43.90613°E (Annex 1. Map #3, Act20); 42.0415°N/43.89268°E (Annex 1. Map #3, Act21); 42.04585°N/43.89487°E (Annex 1. Map #3, Act22); 42.06282°N/43.90418°E (Annex 1. Map #3, Act23); 42.06641°N/43.90477°E (Annex 1. Map #3, Act24); 42.10501°N/43.94479°E (Annex 1. Map #3, Act25); 42.10018°N/43.9422°E (Annex 1. Map #3, Act26); 42.0575°N/43.94041°E (Annex 1. Map #3, Act27); 42.05902°N/43.94883°E (Annex 1. Map #3, Act28); 42.06007°N/43.90279°E (Annex 1. Map #3, Act29); 42.05056°N/43.94274°E (Annex 1. Map #3, Act30). Places with relatively high bat activity were not recorded. In total, 178+ bat acoustic contacts were recorded**.**

Species recorded on the 3 of August:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 133+ contacts
2. Nathusius'/Kuhl's pipistrelle *Pipistrellus nathusii/kuhlii*) – 30 contacts
3. Serotine Bat (*Eptesicus serotinus*) – 4 contacts
4. Particoloured Bat (*Vespertilio murinus*) – 10 contacts
5. Bat – 1 contact

The 04/08 night – One 9m mist net was installed on the coordinates 42.07389°N/ 43.95850°E (Annex 1, Map#2, NET6; Annex 3, Pic.31). In this area, there were sounds of Mouse-eared Bat (*Myotis sp*) genus representatives. For identification on the species level, a mist net was installed. No Bats were caught, however there were contacts of Common Pipistrelle Bat (*Pipistrellus pipistrellus*) and Serotine Bat (*Eptesicus serotinus*) during the whole study night.

The 11/08 night - the conducted field survey covered the red-colored field routes shown on Annex 1 - Map#1). Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E were conducted. Total length of the field routes 33.7km. Places with relatively high bat activity were not recorded. In total, 206 bat acoustic contacts were recorded.

Species recorded on the 11 of August:

1. Common Pipistrelle Bat (Pipistrellus pipistrellus) – 132 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 23 contacts
3. Serotine Bat (*Eptesicus serotinus*) – 15 contacts
4. Particoloured Bat (*Vespertilio murinus*) – 10 contacts
5. Mouse-eared Bat (*Myotis sp*) – 26 contacts
6. Noctule (*Nyctalus sp*) – 1 contacts

The 12/08 night – the conducted field survey covered the purple-colored field routes shown on Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates 42.04673°N/43.95865°E; were conducted. Total length of the field routes 38km. Relatively high bat activity was recorded close to the coordinates: 42.0363°N/ 43.98988°E (Annex 1. Map #3, Act32). In total, 38+ bat acoustic contacts were recorded.

Species recorded on the 12 of August:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 12 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 20 contacts
3. Particoloured Bat (*Vespertilio murinus*) – 6 contacts

The 13/08 night – One 9m mist net was installed on the same coordinates 42.07389°N/ 43.95850°E (Annex 1, Map#2, NET6; Annex 3, Pic.31) to identify which species of genus Mouse-eared Bat (*Myotis sp*) are represented at this place. Two males of David's Mouse-eared bat (*Myotis davidii*) were caught (Annex3, Pic.32, Pic33). There were contacts of Common Pipistrelle Bat (*Pipistrellus pipistrellus*) and Serotine Bat (*Eptesicus serotinus*) during the whole study night.

The 14/08 night - the conducted field survey covered the white-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates 42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates 42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates 42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates 42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Total length of the field routes 32.08km. Places with relatively high bat activity were not recorded. In total, 80 bat acoustic contacts were recorded**.**

Species recorded on the 14 of August:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 51 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 12 contacts
3. Serotine Bat (*Eptesicus serotinus*) – 8 contacts
4. Noctule (*Nyctalus sp*) – 6 contacts
5. European free-tailed bat (*Tadarida teniotis*) – 1 contact

The 21/08 night - the conducted field survey covered the red-colored field routes shown on Annex 1 - Map#1). Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E were conducted. Total length of the field routes 33.7km. Places with relatively high bat activity were not recorded. In total, 95 bat acoustic contacts were recorded.

Species recorded on the 21 of August:

1. Common Pipistrelle Bat (Pipistrellus pipistrellus) – 72 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 15 contacts
3. Serotine Bat (*Eptesicus serotinus*) – 3 contacts
4. Mouse-eared Bat (*Myotis sp*) – 4 contacts
5. Noctule (*Nyctalus sp*) – 1 contacts

The 22/08 night – the conducted field survey covered the purple-colored field routes shown on Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates 42.04673°N/43.95865°E; were conducted. Total length of the field routes 38km. Places with relatively high bat activity were not recorded. In total, 20 bat acoustic contacts were recorded.

Species recorded on the 22 of August:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 12 contacts

2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 5 contacts
3. Particoloured Bat (*Vespertilio murinus*) – 2 contacts
4. Noctule (*Nyctalus sp*) – 1 contact

The 23/08 night - the conducted field survey covered the white-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates 42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates 42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates 42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates 42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Total length of the field routes 32.08km. Places with relatively high bat activity were not recorded. In total, 31 bat acoustic contacts were recorded**.**

Species recorded on the 23 of August:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 21 contacts
2. Nathusius'/Kuhl's pipistrelle *Pipistrellus nathusii/kuhlii*) – 10 contacts

The 24/08 night – One 9m mist net was installed on the same coordinates 42.07389°N/43.95850°E (Annex 1, Map#2, NET6; Annex 3, Pic.31). We repeated the mist netting area to identify whether there is a small colony of species - David's Mouse-eared bat (*Myotis davidii*) - caught on 13 August or there is feeding area. No bats were caught. In total, 17 bat acoustic contacts were recorded**.**

Species recorded on the 24 of August:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 10 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 4 contacts
3. Mouse-eared Bat (*Myotis sp*) – 3 contacts

The 30/08 night - the conducted field survey covered the red-colored field routes shown on Annex 1 - Map#1). Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E were conducted. Total length of the field routes 33.7km. Relatively high bat activity was recorded close to the coordinates: 42.07845°N/43.99387°E (Annex 1. Map #3, Act33). In total, 144+ bat acoustic contacts were recorded.

Species recorded on the 30 of August:

1. Common Pipistrelle Bat (Pipistrellus pipistrellus) – 102+ contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 24 contacts
3. Serotine Bat (*Eptesicus serotinus*) – 5 contacts
4. Noctule (*Nyctalus sp*) – 3 contacts
5. Mouse-eared Bat (*Myotis sp*) – 8 contacts
6. Long eared bat (*Plecotus sp*) – 1 contact
7. Bat – 1 contact

The 31/08 night – the conducted field survey covered the purple-colored field routes shown on Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates

42.04673°N/43.95865°E; were conducted. Total length of the field routes 38km. Places with relatively high bat activity were not recorded. In total, 38 bat acoustic contacts were recorded.

Species recorded on the 31 of August:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 12 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 23 contacts
3. Noctule (*Nyctalus sp*) – 3 contacts

The 01/09 night - the conducted field survey covered the white-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates 42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates 42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates 42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates 42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Total length of the field routes 32.08km. Relatively high bat activity was recorded close to the coordinates: 42.10443°N/43.94468°E (Annex 1. Map #3, Act34); 42.07845°N/43.99387°E (Annex 1. Map #3, Act35). In total, 165+ bat acoustic contacts were recorded**.**

Species recorded on the 1 of September:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 93+ contacts
2. Soprano Pipistrelle (*Pipistrellus pygmaeus*) - 2 contacts
3. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 45 contacts
4. Serotine Bat (*Eptesicus serotinus*) – 9 contacts
5. Noctule (*Nyctalus sp*) – 11 contacts
6. European free-tailed bat (*Tadarida teniotis*) – 5 contacts

The 02/09 night – One 9m mist net was installed on the coordinates 42.06540°N/43.97765°E (Annex 1, Map#2, NET7; Annex 3, Pic.34). Autumn is a swarming season for bats and during this season bats often use such abandoned buildings. No bats were caught. There were occasional contacts of Common Pipistrelle Bat (*Pipistrellus pipistrellus*).

The 12/09 night - the conducted field survey covered the red-colored field routes shown on Annex 1 - Map#1). Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E were conducted. Total length of the field routes 33.7km. Relatively high bat activity was recorded close to the coordinates: 42.08510°N/ 44.00106°E (Annex 1. Map #3, Act8); 42.0825°N/43.97506°E (Annex 1. Map #3, Act13); 42.08253°N/43.96848°E (Annex 1. Map #3, Act36). In total, 98+ bat acoustic contacts were recorded.

Species recorded on the 12th of September:

1. Common Pipistrelle Bat (Pipistrellus pipistrellus) – 52 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 40 contacts
3. Particoloured Bat (*Vespertilio murinus*) – 1 contact
4. Noctule (*Nyctalus sp*) – 2 contacts
5. Mouse-eared Bat (*Myotis sp*) – 3 contacts

The 13/09 night – the conducted field survey covered the purple-colored field routes shown on Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates

42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates 42.04673°N/43.95865°E; were conducted. Total length of the field routes 38km. Places with relatively high bat activity were not recorded. In total, 19 bat acoustic contacts were recorded.

Species recorded on the 13th of September:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 4 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 8 contacts
3. European free-tailed bat (*Tadarida teniotis*) – 1 contact
4. Noctule (*Nyctalus sp*) – 4 contacts
5. Bat – 1 contact

The 14/09 night - the conducted field survey covered the white-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates 42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates 42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates 42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates 42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Total length of the field routes 32.08km. Places with relatively high bat activity were not recorded. In total, 45 bat acoustic contacts were recorded**.**

Species recorded on the 14th of September:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 13 contacts
2. Soprano Pipistrelle (*Pipistrellus pygmaeus*) - 10 contacts
3. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 18 contacts
4. Noctule (*Nyctalus sp*) – 2 contacts
5. Bat – 2 contacts

The 15/09 night – One 9m mist net was installed on the same coordinates 42.06540°N/43.97765°E (Annex 1, Map#2, NET7; Annex 3, Pic.34). We installed the net once again in the same place as 2 September since autumn is swarming season for bats and during this season bats often use such abandoned buildings. No bats were caught. There were occasional contacts with Common Pipistrelle Bat (*Pipistrellus pipistrellus*).

The 24/09 night - the conducted field survey covered the red-colored field routes shown on Annex 1 - Map#1). Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E were conducted. Total length of the field routes 16.85km. No bats activity was recorded.

The 25/09 night – the conducted field survey covered the purple-colored field routes shown on Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates 42.04673°N/43.95865°E; were conducted. Total length of the field routes 19km. Places with relatively high bat activity were not recorded. In total, 16 bat acoustic contacts were recorded.

Species recorded on the 25th of September::

1. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 15 contacts
2. Bat – 1 contact

The 26/09 night - the conducted field survey covered the white-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates 42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates 42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates 42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates 42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Total length of the field routes 16.04km. Places with relatively high bat activity were not recorded. In total, 6 bat acoustic contacts were recorded**.**

Species recorded on the 26th of September:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 3 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 2 contacts
3. Bat – 1 contact

The 03/10 night - the conducted field survey covered the red-colored field routes shown on Annex 1 - Map#1). Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E were conducted. Total length of the field routes 16.85km. Relatively high bat activity was recorded close to the coordinates: 42.08515°N/44.00861°E (Annex 1. Map #3, Act37)In total, 165+ bat acoustic contacts were recorded.

Species recorded on the 3 of October:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 126+ contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 31 contacts
3. European free-tailed bat (*Tadarida teniotis*) – 1 contact
4. Noctule (*Nyctalus sp*) – 7 contacts

The 04/10 night – the conducted field survey covered the purple-colored field routes shown on Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates 42.04673°N/43.95865°E; were conducted. Total length of the field routes 19km. Places with relatively high bat activity were not recorded. In total, 19 bat acoustic contacts were recorded.

Species recorded on the 4 of October:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 9 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 5 contacts
3. Noctule (*Nyctalus sp*) – 5 contacts

The 05/10 night - the conducted field survey covered the white-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates 42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates 42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates

42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates 42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Total length of the field routes 16.04km. Places with relatively high bat activity were not recorded. In total, 151 bat acoustic contacts were recorded**.**

Species recorded on the 26th of September:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 50 contacts
2. Soprano Pipistrelle (*Pipistrellus pygmaeus*) - 1 contact
3. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 66 contacts
4. Serotine Bat (*Eptesicus serotinus*) – 2 contacts
5. Noctule (*Nyctalus sp*) – 31 contacts
6. Bat – 1 contact

The 17/10 night - the conducted field survey covered the red-colored field routes shown on Annex 1 - Map#1). Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E were conducted. Total length of the field routes 16.85km. Places with relatively high bat activity were not recorded. In total, 75 bat acoustic contacts were recorded.

Species recorded on the 17th of October:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 60 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 15 contacts

The 18/10 night – the conducted field survey covered the purple-colored field routes shown on Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates 42.04673°N/43.95865°E; were conducted. Total length of the field routes 19km. No bats activity was recorded.

The 19/10 night - the conducted field survey covered the white-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates 42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates 42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates 42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates 42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Total length of the field routes 16.04km. No bats activity was recorded.

The 31/10 night - the conducted field survey covered the red-colored field routes shown on Annex 1 - Map#1). Field routes from the coordinates 42.10861°N/43.96436°E to the coordinates 42.09838°N/43.95993°E; and from the coordinates 42.09655°N/44.00124°E to the coordinates 42.10276°N/44.00476°E; from the coordinates 42.08511°N/43.99394°E to the coordinates 42.08522°N/44.00887°E; from the coordinates 42.07900°N/44.00484°E to the coordinates 42.07769°N/43.99365°E; and from the coordinates 42.10689°N/43.98757°E to the coordinates 42.07580°N/43.95833°E were conducted. Total length of the field routes 16.85km. Places with relatively high bat activity were not recorded. In total, 59 bat acoustic contacts were recorded.

Species recorded on the 31st of October:

1. Common Pipistrelle Bat (*Pipistrellus pipistrellus*) – 30 contacts
2. Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*) – 4 contacts
3. Serotine Bat (*Eptesicus serotinus*) – 4 contacts
4. Noctule (*Nyctalus sp*) – 21 contacts

The 01/11 night – the conducted field survey covered the purple-colored field routes shown on Annex 1 - Map#1. Field routes between the coordinates: 42.01682°N/43.99667°E, 42.01791°N/44.00970°E and 42.01379°N/44.01019°E, as well as from the coordinates 42.025715°N/44.00972°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.05398°N/43.98253°E to the coordinates 42.04794°N/43.99309°E; from the coordinates 42.04794°N/43.99309°E to the coordinates 42.04673°N/43.95865°E; were conducted. Total length of the field routes 19km. No bats activity was recorded.

The 02/11 night - the conducted field survey covered the white-colored field routes shown on Annex 1 - Map#1. Field routes from the coordinates 42.06464°N/43.95721°E to the coordinates 42.05979°N/43.94073°E; from the coordinates 42.06200°N/43.94259°E to the coordinates 42.05053°N/43.94281°E; from the coordinates 42.10845°N/43.94751°E to the coordinates 42.09894°N/43.94010°E; from the coordinates 42.08828°N/43.91249°E to the coordinates 42.08846°N/43.91564°E; from the coordinates 42.09021°N/43.90800°E to the coordinates 42.10068°N/43.89708°E; from the coordinates 42.06885°N/43.90900°E to the coordinates 42.05521°N/43.90090°E; from the coordinates 42.05553°N/43.89886°E to the coordinates 42.04016°N/43.89212°E; and on the coordinates 42.09729°N/43.92292°E were conducted. Total length of the field routes 16.04km. No bats activity was recorded.

In total, during the field-works carried out from 05.04.2022 through 02.11.2022, more than 1500 kilometers long field-route was covered (Table #2). About 15 bat species or genus have been recorded during the research; in particular, ten species and/or genus were identified by the handheld detectors, 11 species and/or genus were identified by the static/passive bat detectors. One species was caught by mist nets. Those species which were not possible to identify during the fieldworks are generally referred as bats (Table #3).

Table #2. Field routes conducted

#	Date	Starting coordinates	Ending coordinates	Color		Map
1.	05.04.2022 17.04.2022 27.04.2022 07.05.2022 21.05.2022 06.06.2022 20.06.2022 04.07.2022 19.07.2022 01.08.2022 11.08.2022 21.08.2022 30.08.2022 12.09.2022 24.09.2022 03.10.2022 17.10.2022 31.10.2022	42.10861°N/ 43.96436°E	42.09838°N/ 43.95993°E	Red	Total length of red colored field routes during survey about 498.3 km	Annex #1, Map #1
		42.09655°N/ 44.00124°E	42.10276°N/ 44.00476°E	Red		Annex #1, Map #1
		42.08511°N/ 43.99394°E	42.08522°N/ 44.00887°E	Red		Annex #1, Map #1
		42.07900°N/ 44.00484°E	42.07769°N/ 43.99365°E	Red		Annex #1, Map #1
		42.10689°N/ 43.98757°E	42.07580°N/ 43.95833°E	Red		Annex #1, Map #1
2.	06.04.2022 18.04.2022 28.04.2022 08.05.2022 22.05.2022 07.06.2022	42.01682°N/ 43.99667°E	42.01379°N/ 44.01019°E	Purple	Total length of red colored field routes during survey about 551 km.	Annex #1, Map #1
		42.025715°N/ 44.00972°E	42.04794°N/ 43.99309°E	Purple		Annex #1, Map #1
		42.05398°N/ 43.98253°E	42.04794°N/ 43.99309°E	Purple		Annex #1, Map #1

#	Date	Starting coordinates	Ending coordinates	Color		Map
	21.06.2022 05.07.2022 20.07.2022 02.08.2022 12.08.2022 22.08.2022 31.08.2022 13.09.2022 25.09.2022 04.10.2022 18.10.2022 01.11.2022	42.04794°N/ 43.99309°E	42.04673 °N/ 43.95865°E	Purple		Annex #1, Map #1
3.	07.04.2022 19.04.2022 29.04.2022 09.05.2022 23.05.2022 08.06.2022 23.06.2022 06.07.2022 21.07.2022 03.08.2022 14.08.2022 23.08.2022 01.09.2022 14.09.2022 26.09.2022 05.10.2022 19.10.2022 02.11.2022	42.06464°N/ 43.95721°E	42.05979°N/ 43.94073°E	White	Total length of red colored field routes during survey about 645.11 km	Annex #1, Map #1
		42.06200°N/ 43.94259°E	42.05053°N/ 43.94281°E	White		Annex #1, Map #1
		42.10845°N/ 43.94751°E	42.09894°N/ 43.94010°E	White		Annex #1, Map #1
		42.08828°N/ 43.91249°E	42.08846°N/ 43.91564°E	White		Annex #1, Map #1
		42.09021°N/ 43.90800°E	42.10068°N/ 43.89708°E	White		Annex #1, Map #1
		42.06885°N/ 43.90900°E	42.05521°N/ 43.90090°E	White		Annex #1, Map #1
		42.05553°N/ 43.89886°E	42.04016°N/ 43.89212°E	White		Annex #1, Map #1

Table #3. Species recorded during survey

#	Common name	Scientific name	Status	Handheld detector	Passive bat detector	Mist net
1.	Mouse-eared Bat	*Myotis sp*		+	+	
2.	Noctule	*Nyctalus sp*		+		
3.	Long-eared bat	*Plecotus sp*		+		
4.	Greater Noctule Bat	*Nyctalus lasiopterus*	IUCN		+	
5.	Leisler's Bat	*Nyctalus leisleri*			+	
6.	Noctule	*Nyctalus noctula*			+	
7.	Serotine Bat	*Eptesicus serotinus*		+	+	
8.	Common Pipistrelle Bat	*Pipistrellus pipistrellus*		+	+	
9.	Soprano Pipistrelle	*Pipistrellus pygmaeus*		+	+	
10.	Nathusius'/Kuhl's Pipistrelle Bat	*Pipistrellus nathusii/ kuhlii*		+	+	
11.	David's Mouse eared bat	*Myotis davidii*				+
12.	Western Barbastelle Bat	*Barbastella barbastellus*	GRL, Emerald Network Priority Species		+	
13.	Particoloured Bat	*Vespertilio murinus*		+	+	
14.	European free-tailed Bat	*Tadarida teniotis*		+	+	
15.	Bat			+		

In addition to the filed-routes, five passive bat detectors were installed on the project area on 2nd of March:

- The first two detectors (BRETI#1 and BRETI#2) were installed at the coordinates 42.09388°N/43.2890227°E. BRETI#1 was installed on the met mast at about 55-60 meters height, BRETI# 2 was installed on the met mast at about 20 meters height.
- The third detector (Ruisi #2) was installed at the coordinates 42.06025°N/43.94561°E, on the met mast at about 50 meters height.
- The fourth detector (Ruisi #3) was installed at the coordinates 42.04969°N/43.98080°E, on the met mast at about 50 meters height.
- The fifth detector (Tree) was installed at the coordinates 42.09476 °N/43.98746°E, on the tree at about 10 meters height, over the canopies (Map #1).

Map #1. Location of passive bat detectors.

As it was mentioned passive bat detectors were installed 02.03.2022. However, due to the weather conditions bat activities were recorded from the end of March and accordingly, records made by the passive bat detectors from 30.03.2022 through 05.11.2022 have been processed for the given report.

Different numbers of bat species have been recorded at four areas – Breti#1, Breti#2, Ruisi#2, Ruisi#3 and TREE by passive bat detectors (Table #4).

Table #4. Recorded species by passive bat detectors

#	Detector/study area	Number of species	Coordinates
1	Breti #1	7	42.09388°N/43.2890227°E
2	Breti #2	11	42.09388°N/43.2890227°E
3	Tree	13	42.09476 °N/43.98746°E
4	Ruisi#2	11	42.06025°N/43.94561°E
5	Ruisi#3	10	42.04969°N/43.98080°E

Distribution of bat species on the sites – Breti #1, Breti#2, Ruisi#2, Ruisi#3 and TREE was defined taking into consideration the species detectability coefficient and according to bat passes/contacts recorded by the static detectors. Data are given in the Figures #1, #2, #3, #4, #5 and #6.

Figure #1. Species according to bat contacts recorded by the passive bat detector

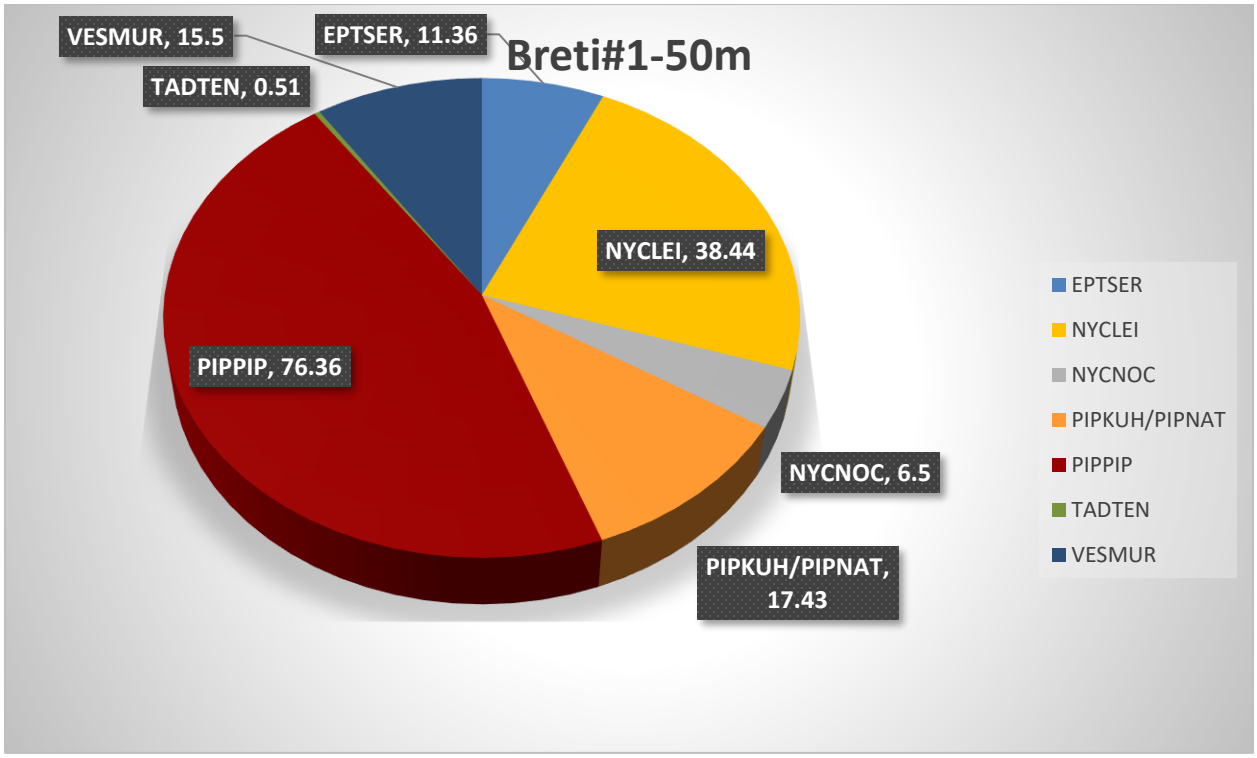


Figure #2. Species according to bat contacts recorded by the passive bat detector

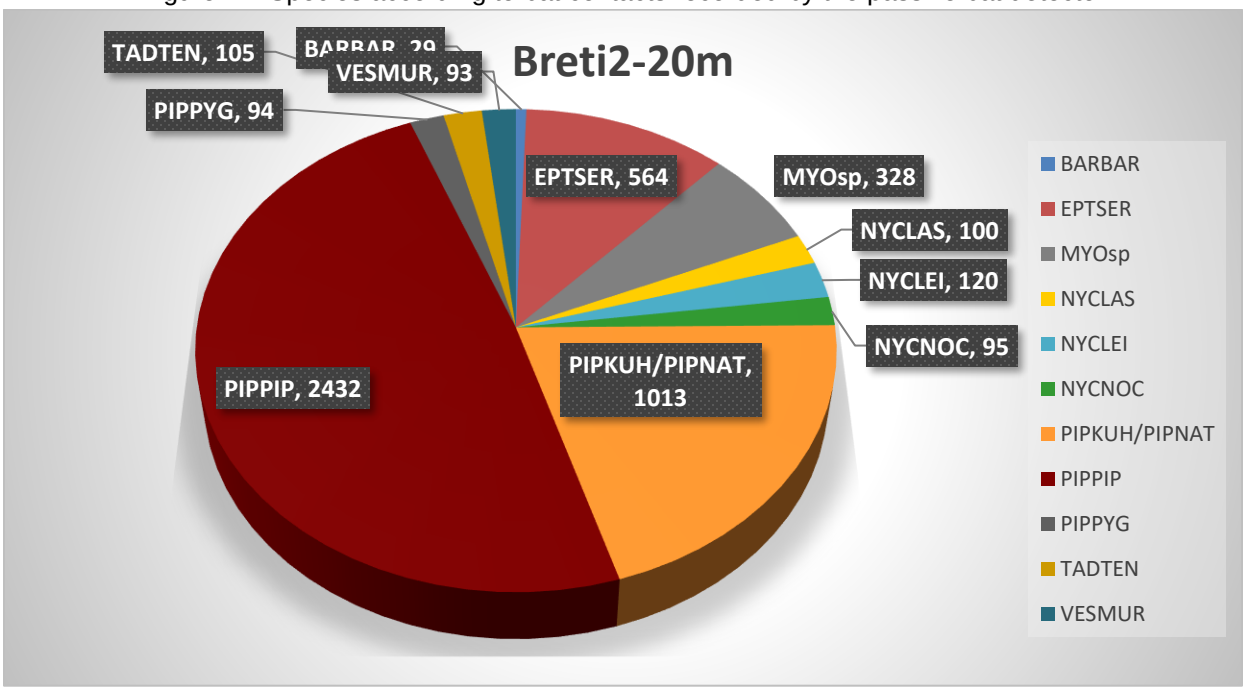


Figure #3. Species according to bat contacts recorded by the passive bat detector

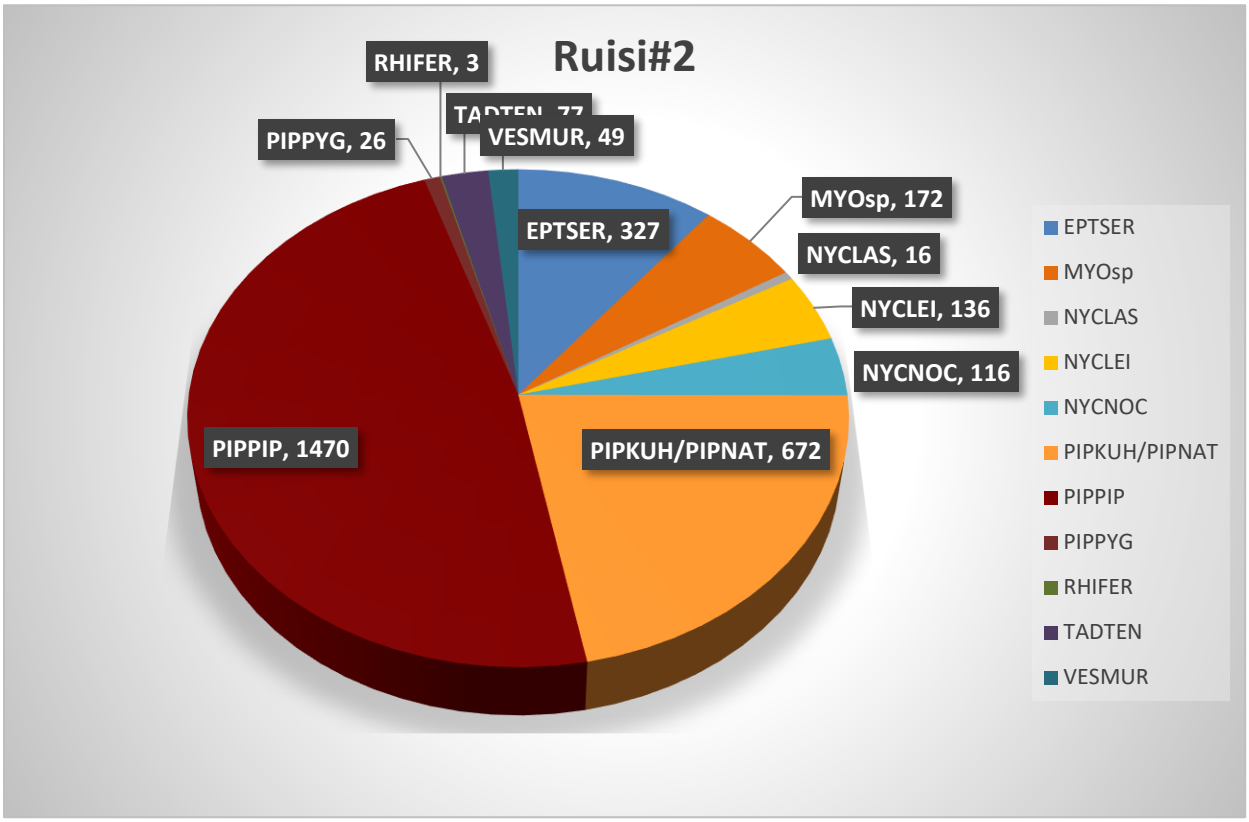


Figure #4. Species according to bat contacts recorded by the passive bat detector

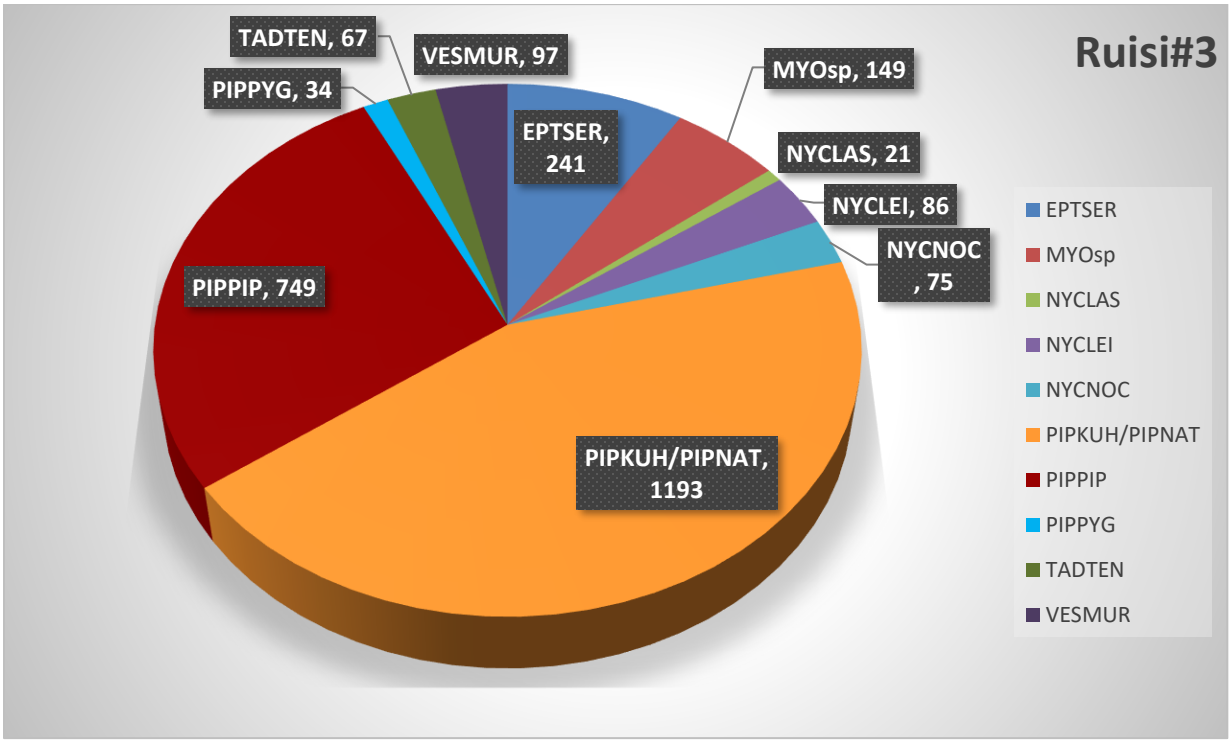


Figure #5. Species according to bat contacts recorded by the passive bat detector

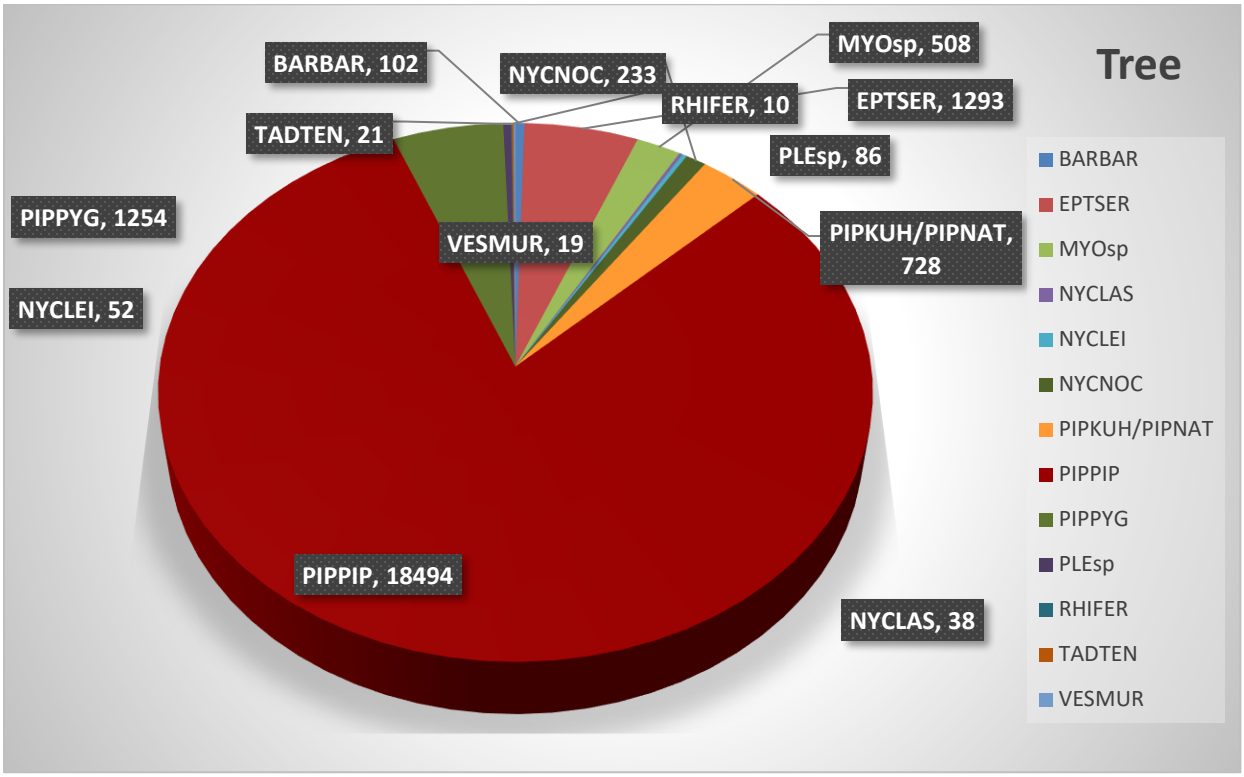
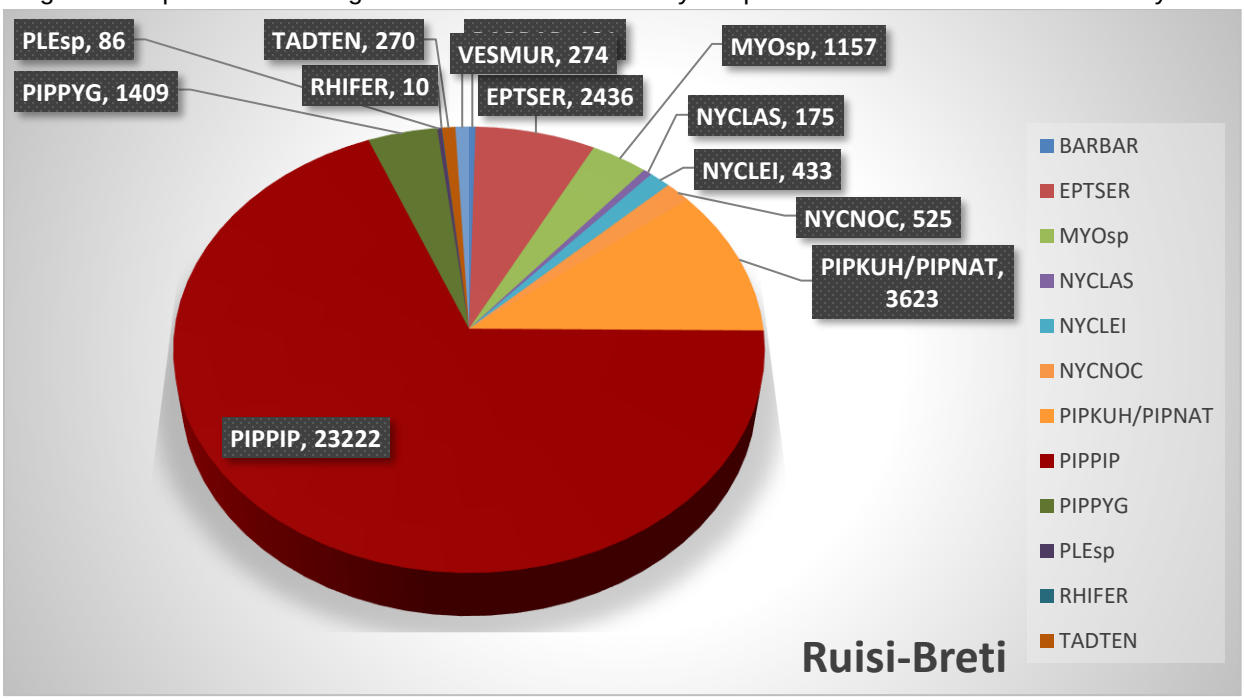


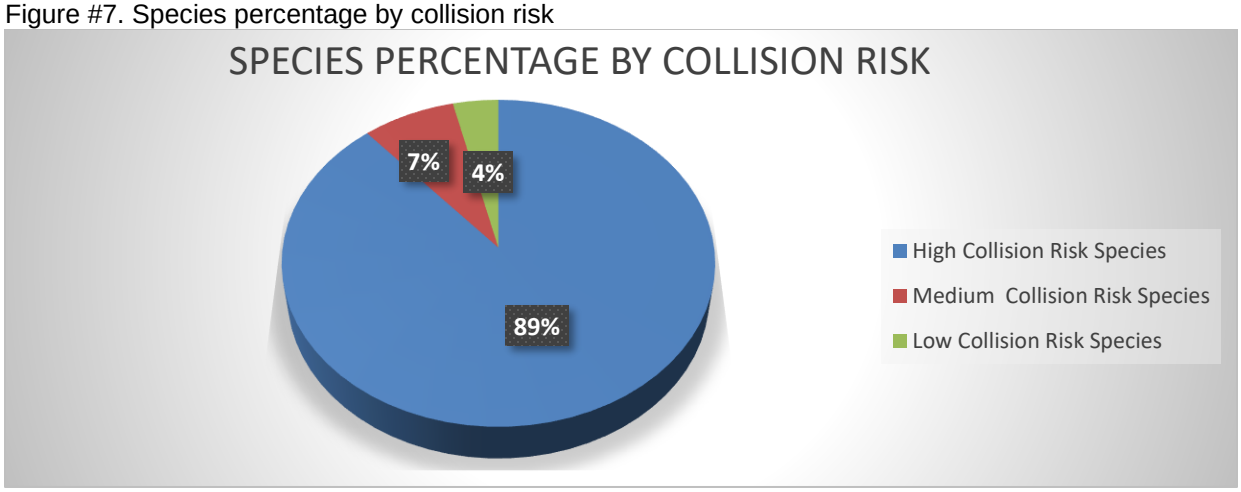
Figure #6. Species according to bat contacts recorded by the passive bat detector for whole study area



Results of the survey from 30.03.2022 through 05.11.2022 showed that number of species - Common Pipistrelle Bat (*Pipistrellus pipistrellus)* was significantly higher in comparison with other species, followed by Nathusius'/Kuhl's Pipistrelle Bat *(Pipistrellus nathusii/kuhlii)*, and Serotine Bat (*Eptesicus serotinus*) – and Soprano pipistrelle (*Pipistrellus pygmaeus*). From the recorded species - *Pipistrellus spp, Hypsugo*

savii, Nyctalus spp, and *Vespertilio murinus* are known as high collision risk species; *Barbastella barbastellus* and *Eptesicus serotinus* are known as medium collision risk species; and *Rhinolophus spp, Myotis spp* with *Plecotus spp* are known as low collision risk species. Consolidation and grouping of species-related data according to the level of collision risk of these species have shown that mostly high-risk species are represented among the recorded species (Figure #7).

Figure #7. Species percentage by collision risk

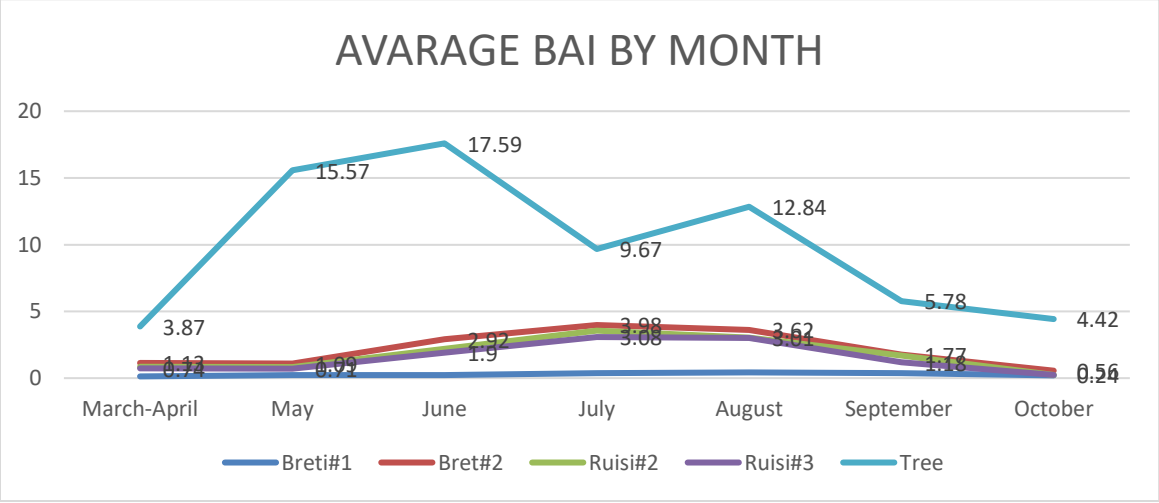


Also, for the study area, average Bat Activity Indices (BAI) was calculated for each month in the period of 30.03.2022 - 05.11.2022 using data obtained from the passive bat detectors. The average BAI for the whole recording period is presented in table #5 and figure #8.

Table #5. The average BAI

#	Detector/study area	BAI						
		March-April	May	June	July	August	September	October
1	Breti#1	0.13	0.23	0.23	0.38	0.43	0.37	0.2
2	Bret#2	1.13	1.09	2.92	3.98	3.62	1.77	0.56
3	Ruisi#2	0.85	0.82	2.19	3.56	3.03	1.7	0.24
4	Ruisi#3	0.74	0.71	1.90	3.08	3.01	1.18	0.24
5	Tree	3.87	15.57	17.59	9.67	12.84	5.78	4.42

Figure #6. Average BAI by in 30.03.2022-05.11.2022



As it is shown, bat activity average indices are quite low for most parts of the project area. Maximum and high indices were recorded close to the coordinates 42.09476°N/43.98746°E. Close to this coordinate, we have windbreakers with matured trees and fruit gardens. Because of relatively well-presented trees, here there is significantly low wind and consequently, good conditions for bats in comparison with other parts of the project area. Here, on the detector TREE, we had highest average BAI by month within the project area in May, June and September and they were 15.57, 17.59 and 12.84 accordingly.

BAI was calculated for each night while detector was installed. Also, average wind speed (WS) for each night was calculated. The BAI by nights in relation to the WS for four passive bat detectors – Breti #1, Breti#2, Ruisi#2, Ruisi#3 are shown on the figures #9 - #36; and the BAI by nights for the fifth detector TREE is shown on the figures #37-#43.

Figure #9. BAI by nights for Breti #1 Passive bat detector

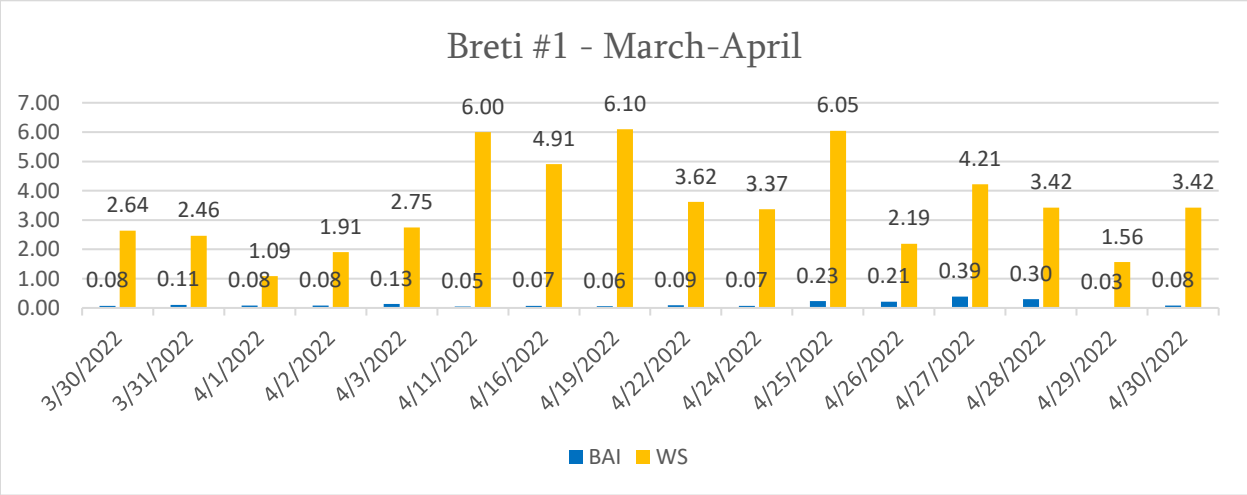


Figure #10. BAI by nights for Breti #1 Passive bat detector

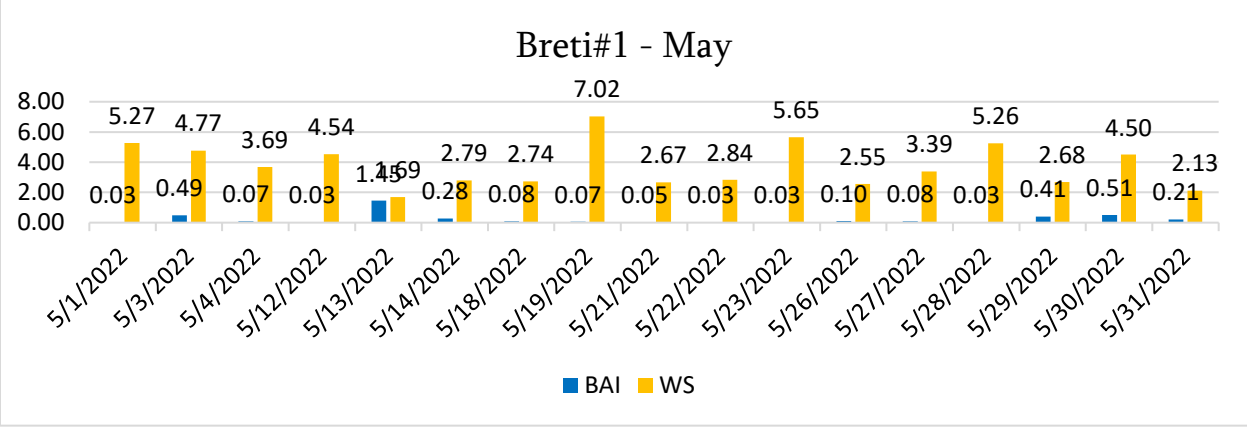


Figure #11. BAI by nights for Breti #1 Passive bat detector

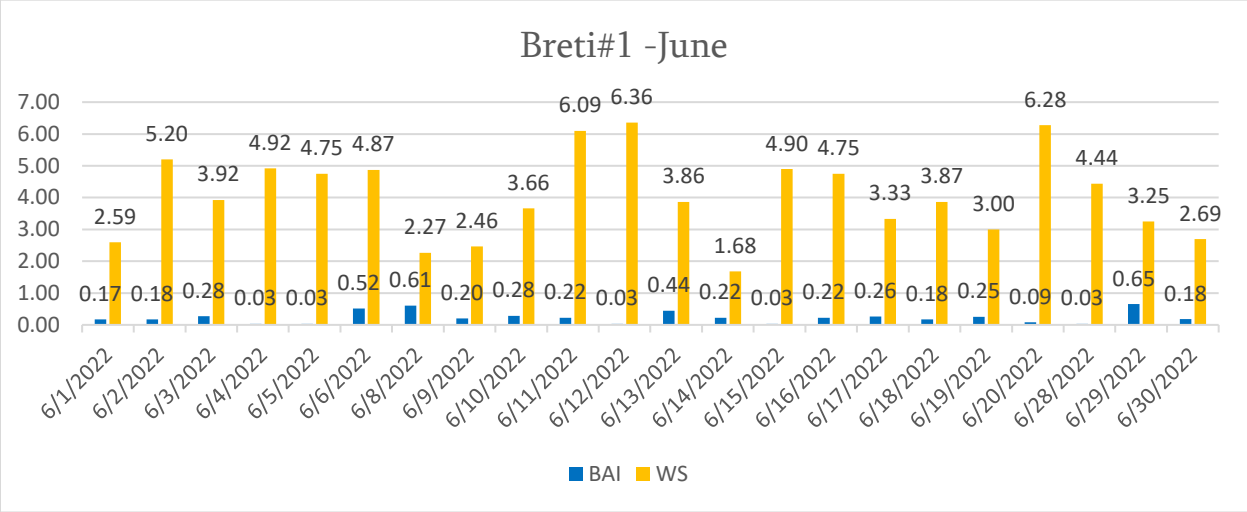


Figure #12. BAI by nights for Breti #1 Passive bat detector

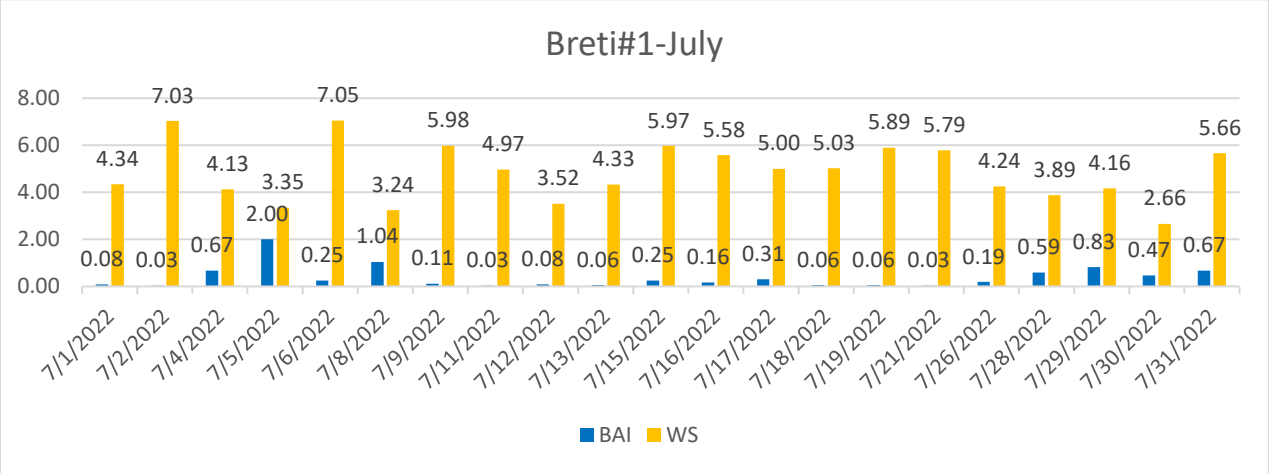


Figure #13. BAI by nights for Breti #2 Passive bat detector

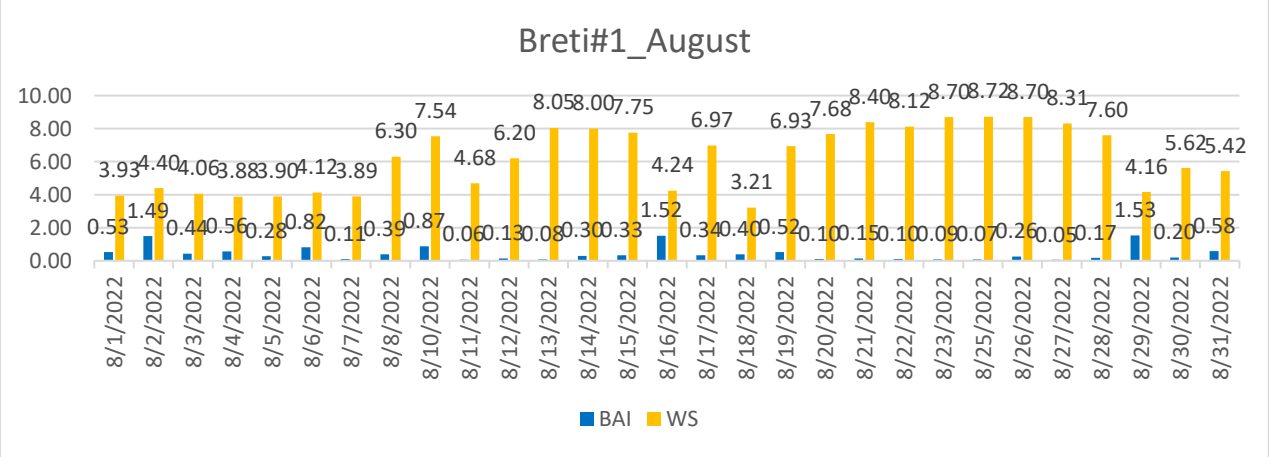


Figure #14. BAI by nights for Breti #2 Passive bat detector

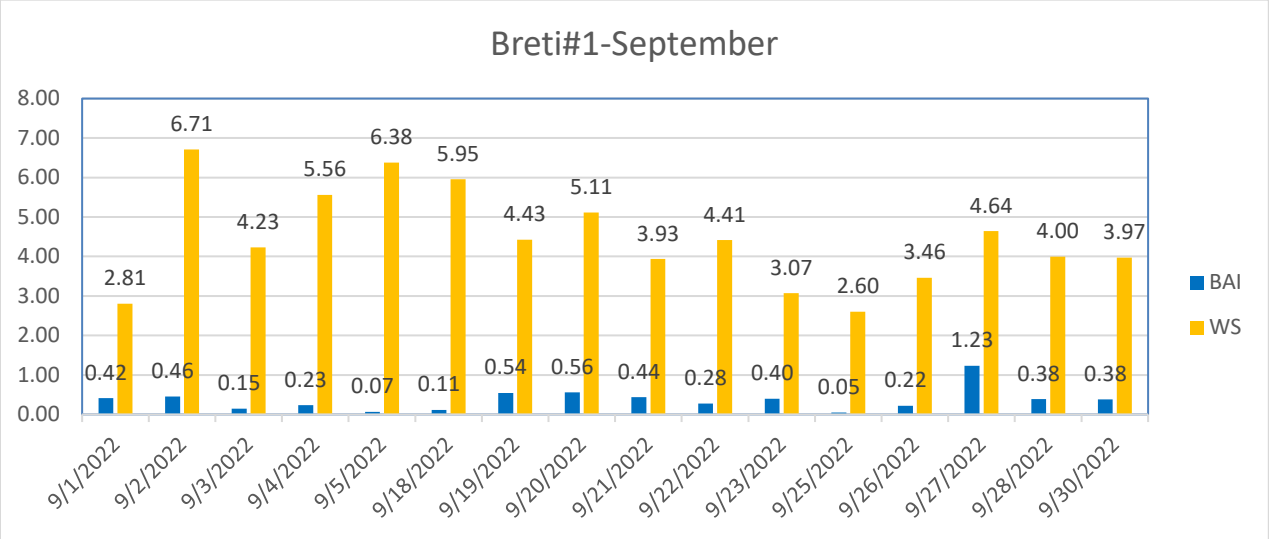


Figure #15. BAI by nights for Breti #2 Passive bat detector

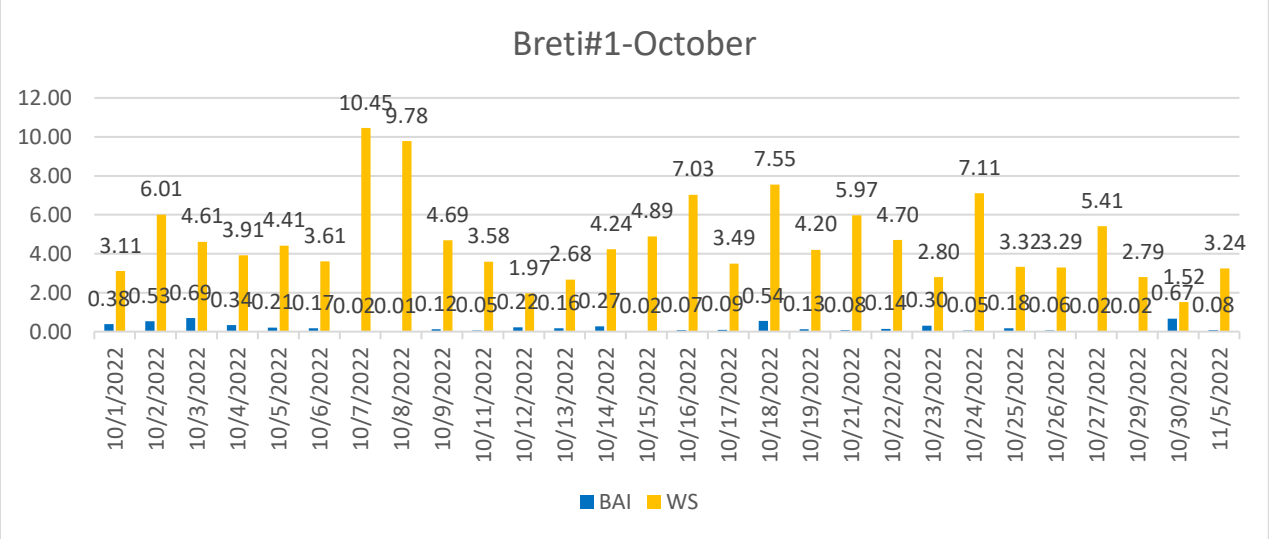


Figure #16. BAI by nights for Breti #2 Passive bat detector

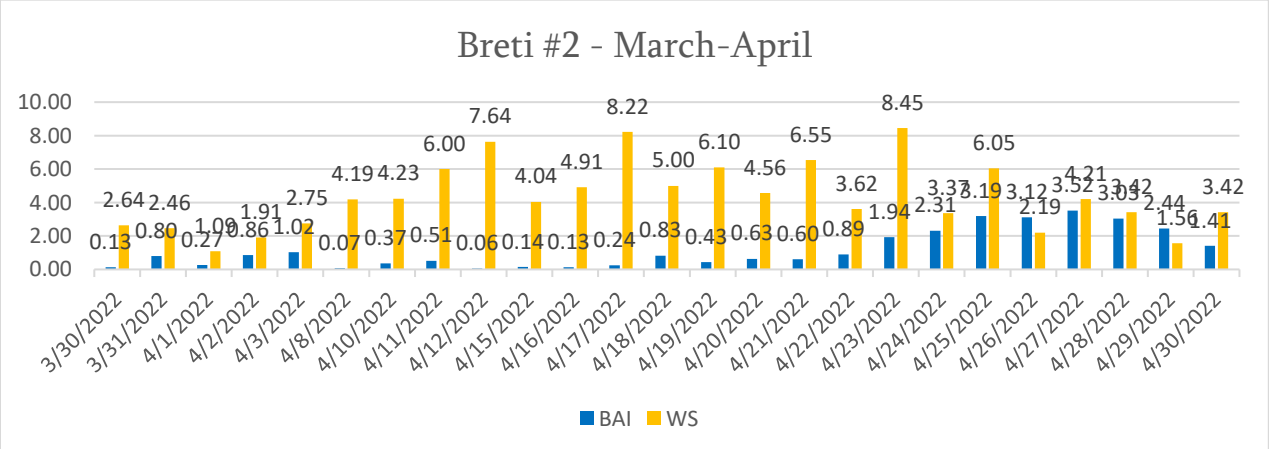


Figure #17. BAI by nights for Breti #2 Passive bat detector

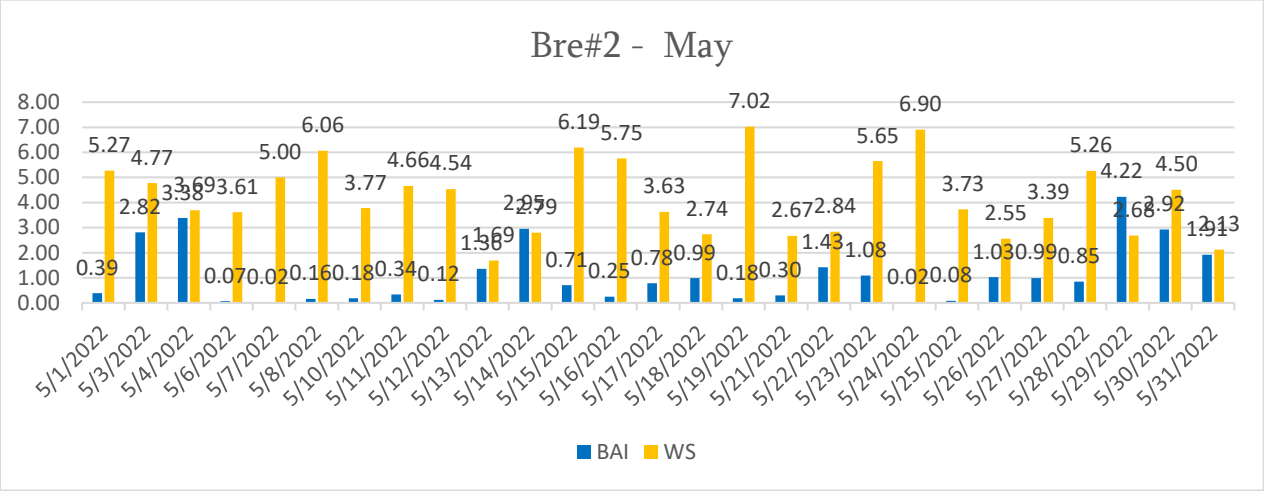


Figure #18. BAI by nights for Breti #2 Passive bat detector

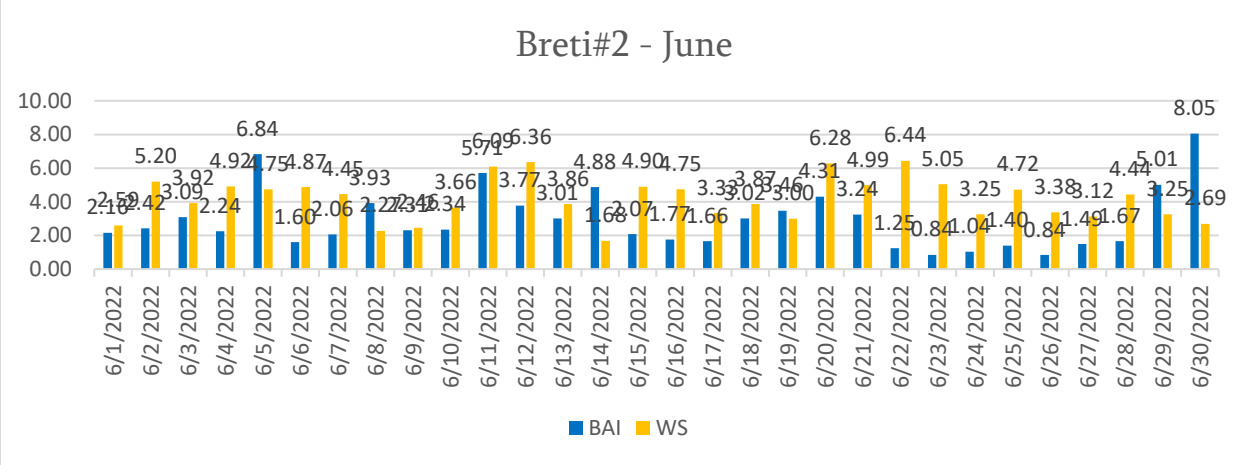


Figure #19. BAI by nights for Breti #2 Passive bat detector

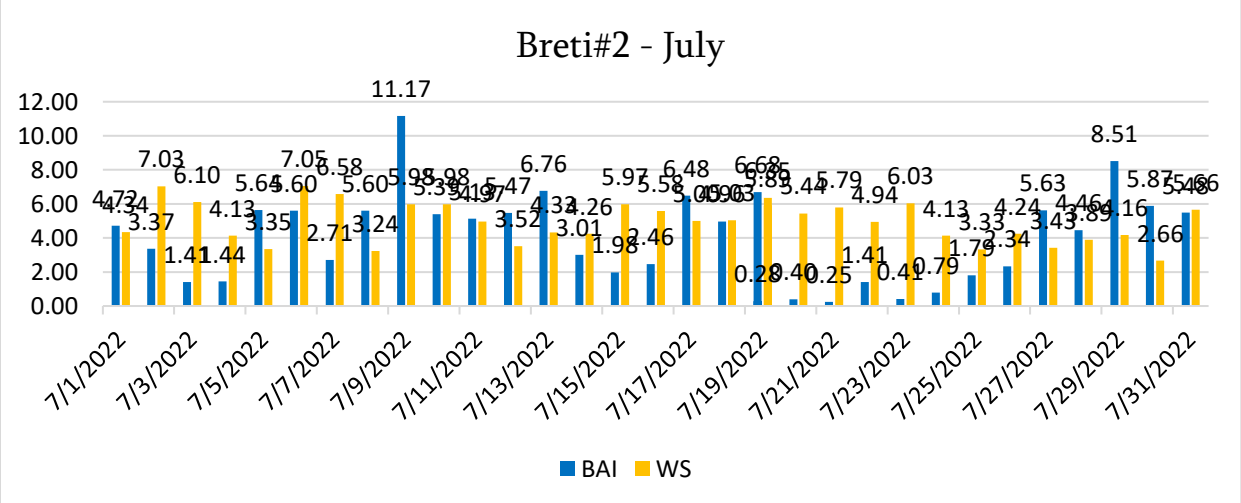


Figure #20. BAI by nights for Breti #2 Passive bat detector

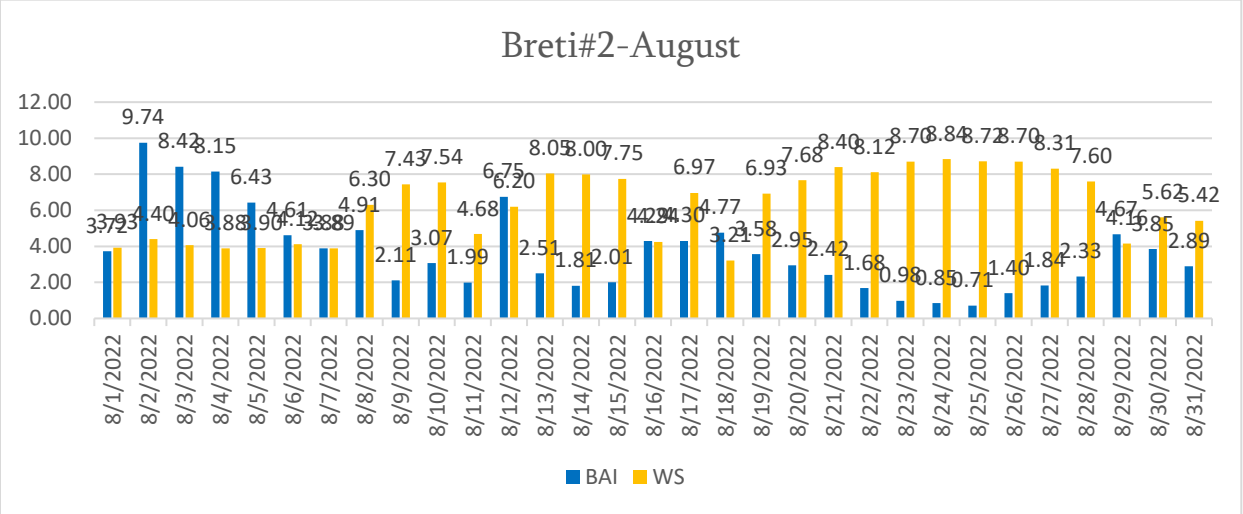


Figure #21. BAI by nights for Breti #2 Passive bat detector

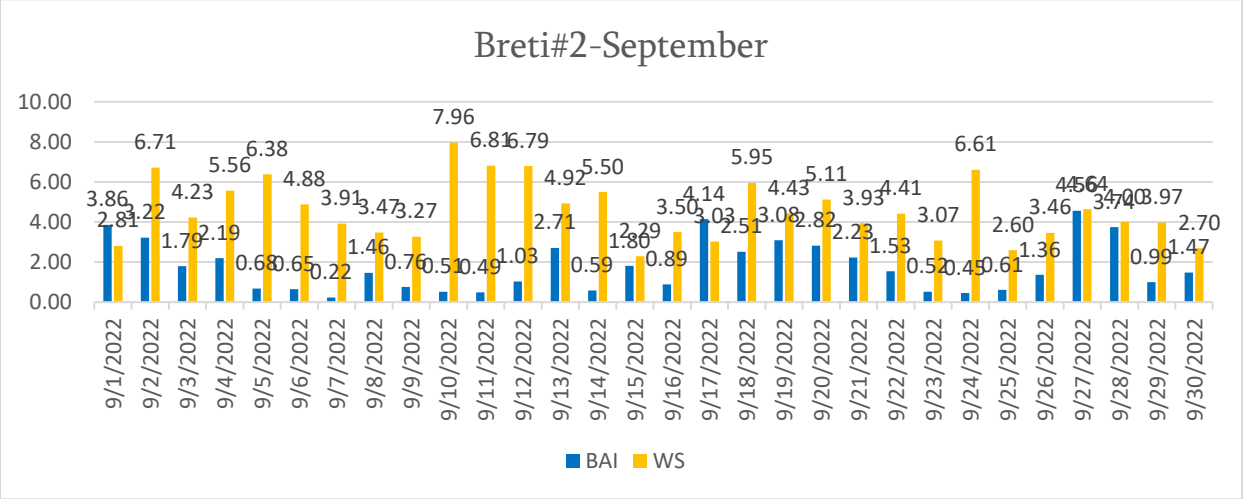


Figure #22. BAI by nights for Breti #2 Passive bat detector

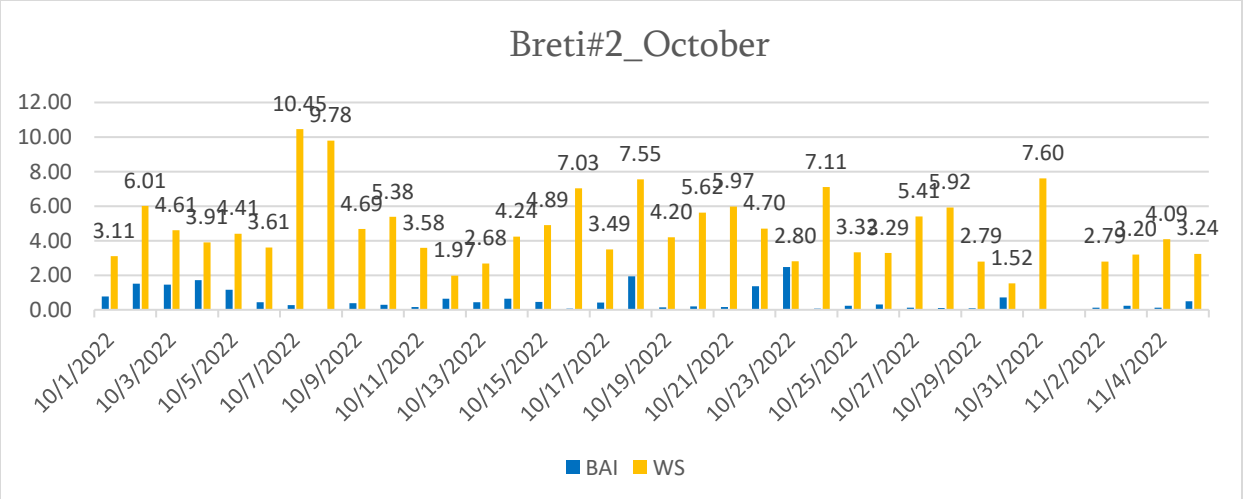


Figure #23. BAI by nights for Ruisi#2 Passive bat detector

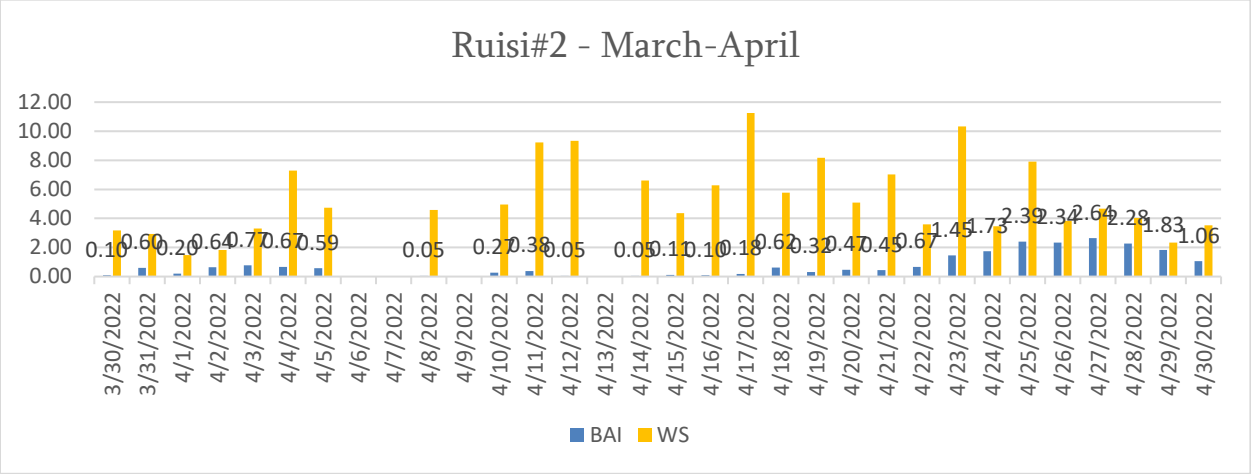


Figure #24. BAI by nights for Ruisi#2 Passive bat detector

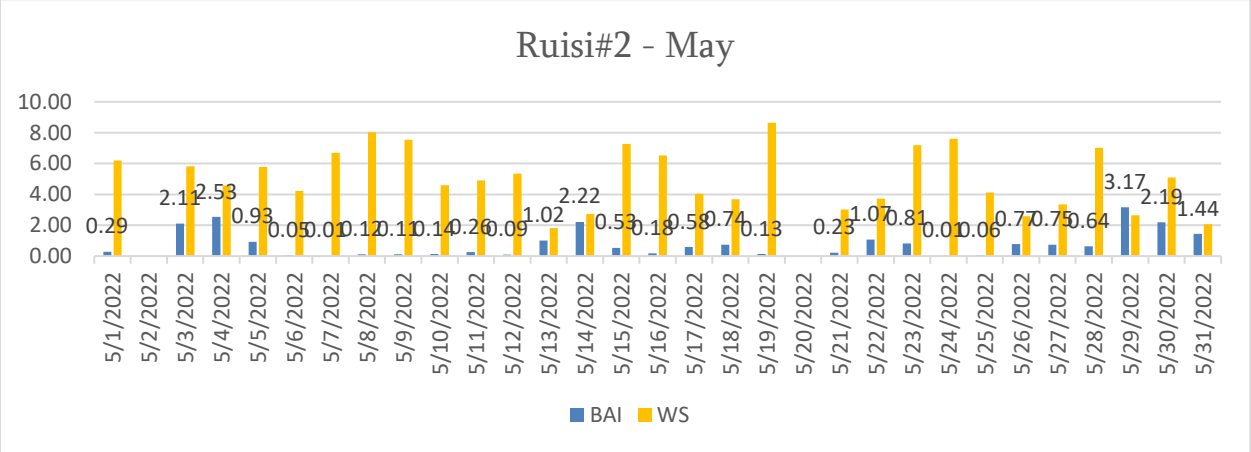


Figure #25. BAI by nights for Ruisi#2 Passive bat detector

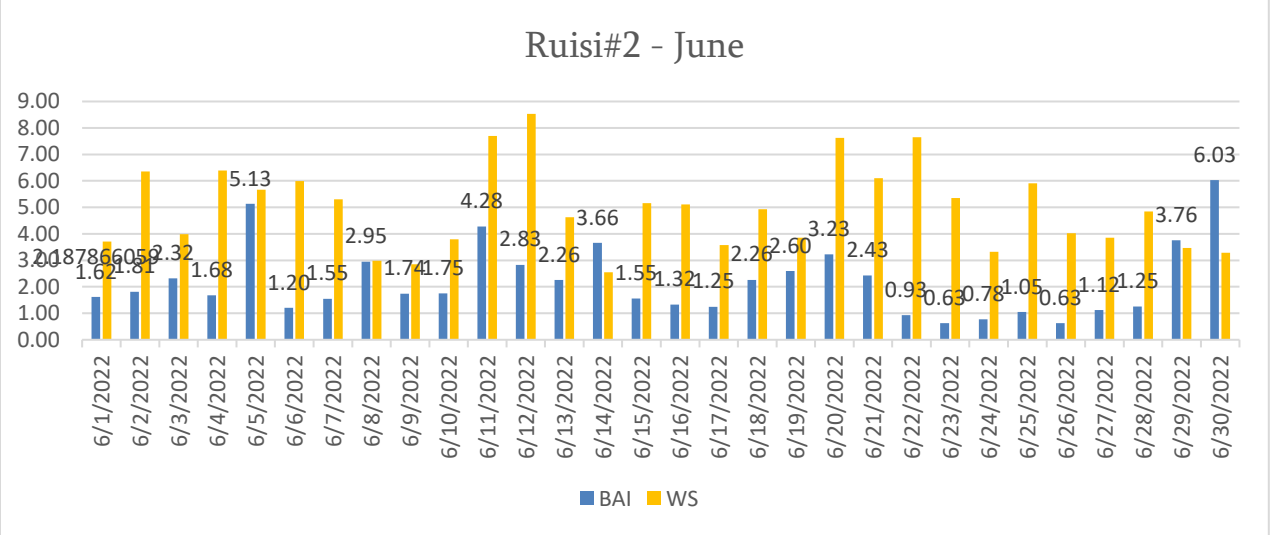


Figure #26. BAI by nights for Ruisi#2 Passive bat detector

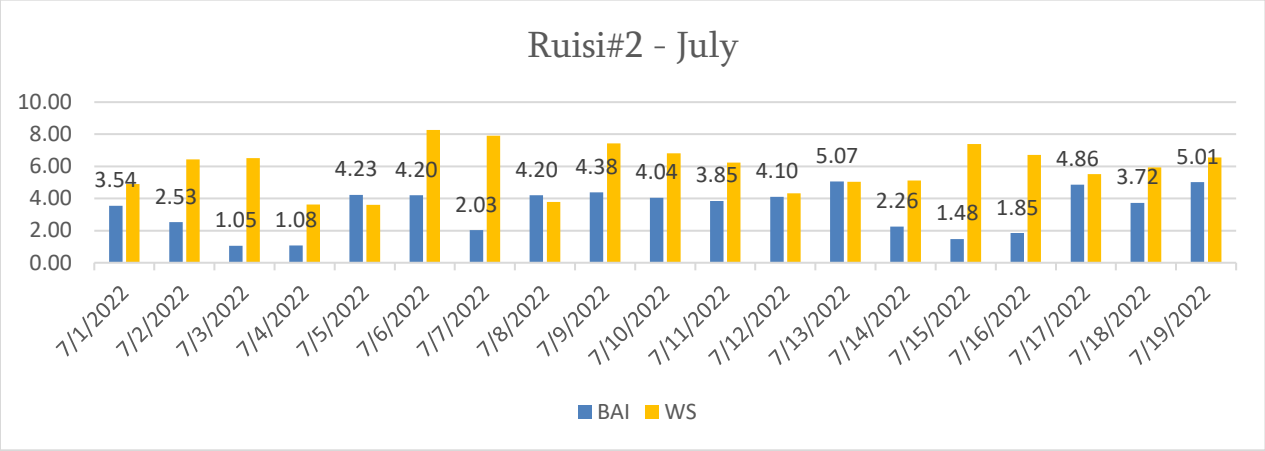


Figure #27. BAI by nights for Ruisi#2 Passive bat detector

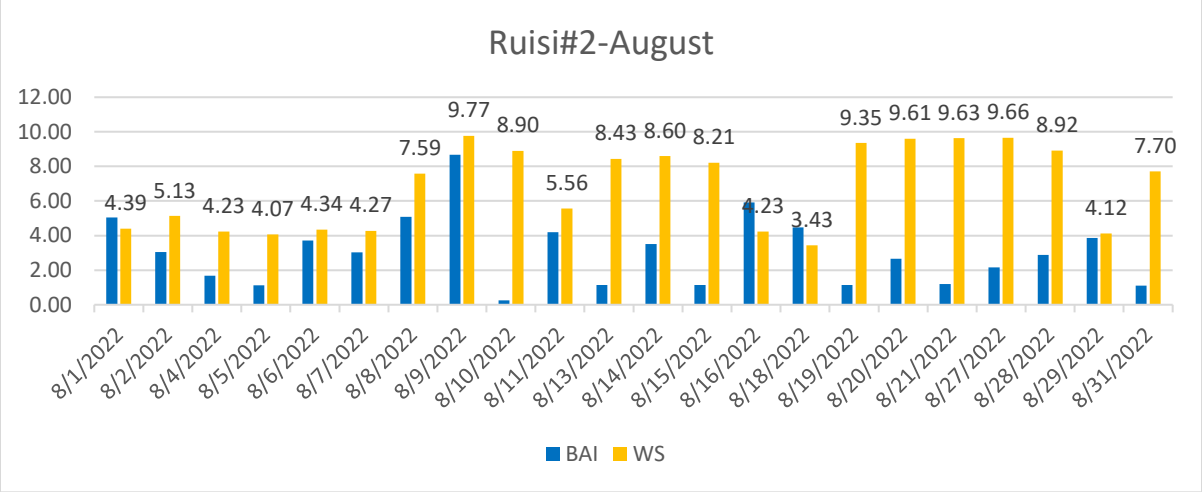


Figure #28. BAI by nights for Ruisi#2 Passive bat detector

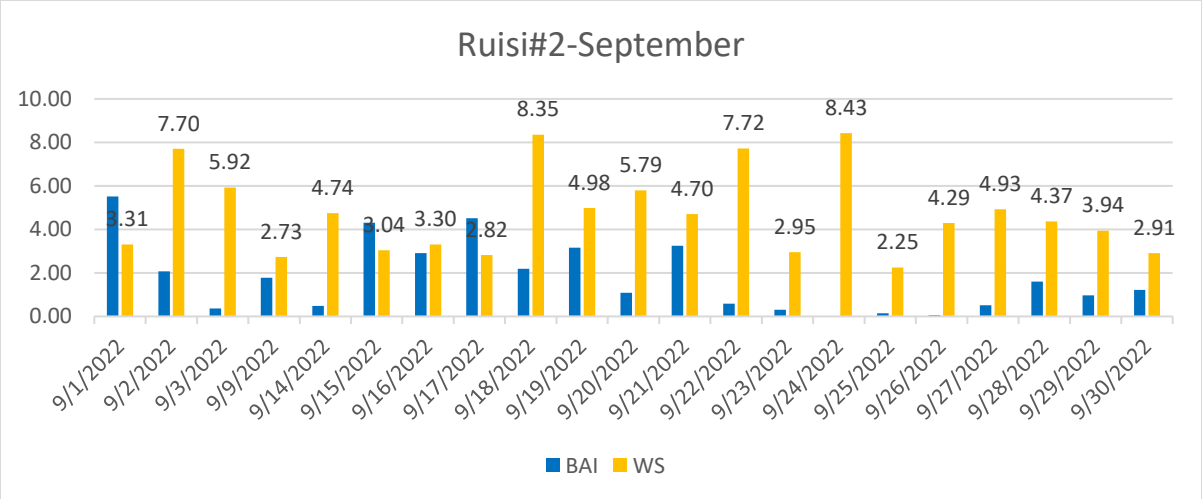


Figure #29. BAI by nights for Ruisi#2 Passive bat detector

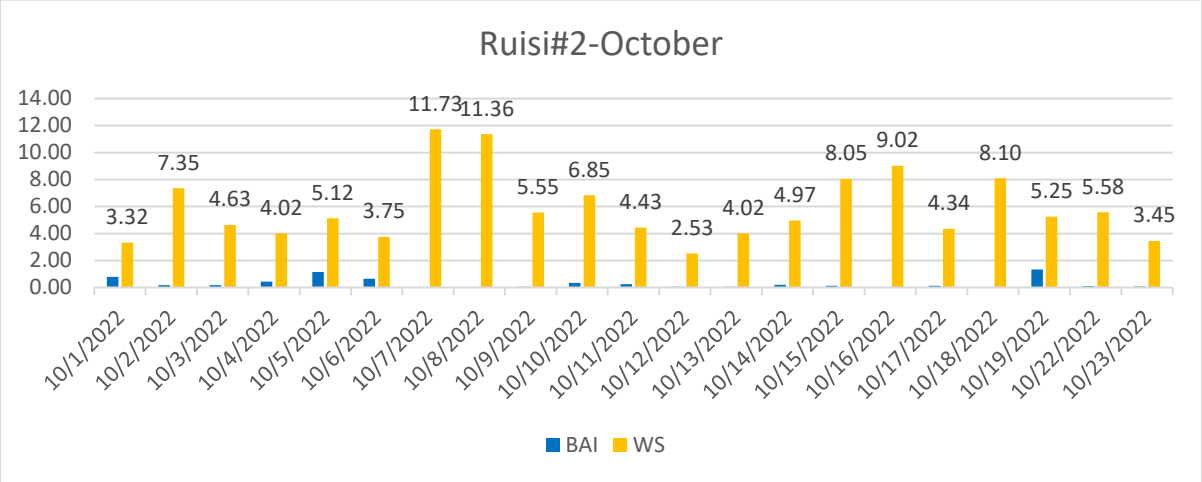


Figure #30. BAI by nights for Ruisi#3 Passive bat detector

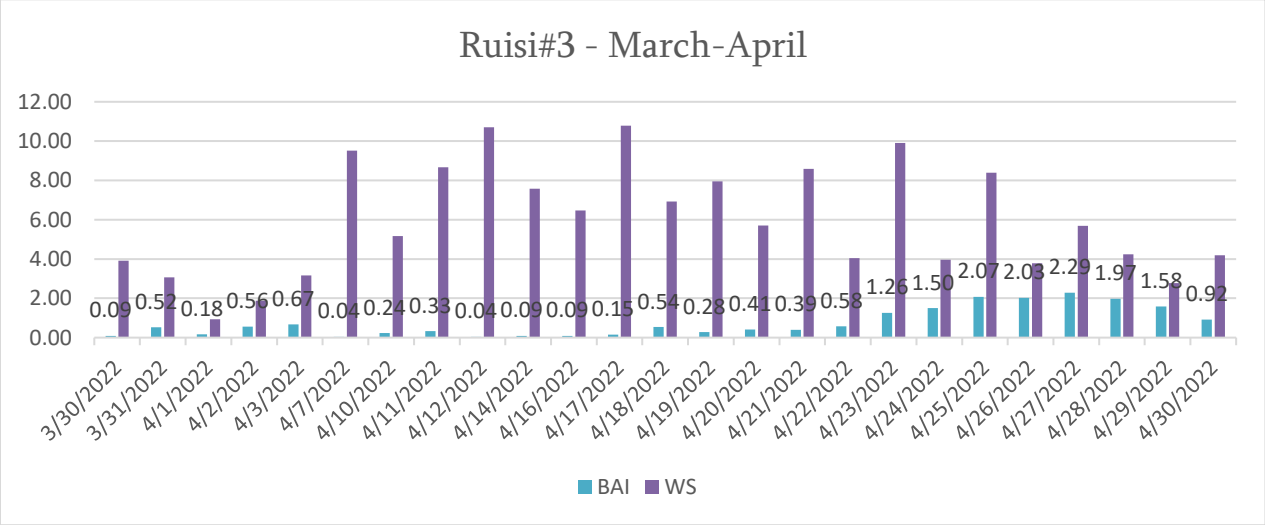


Figure #31. BAI by nights for Ruisi#3 Passive bat detector

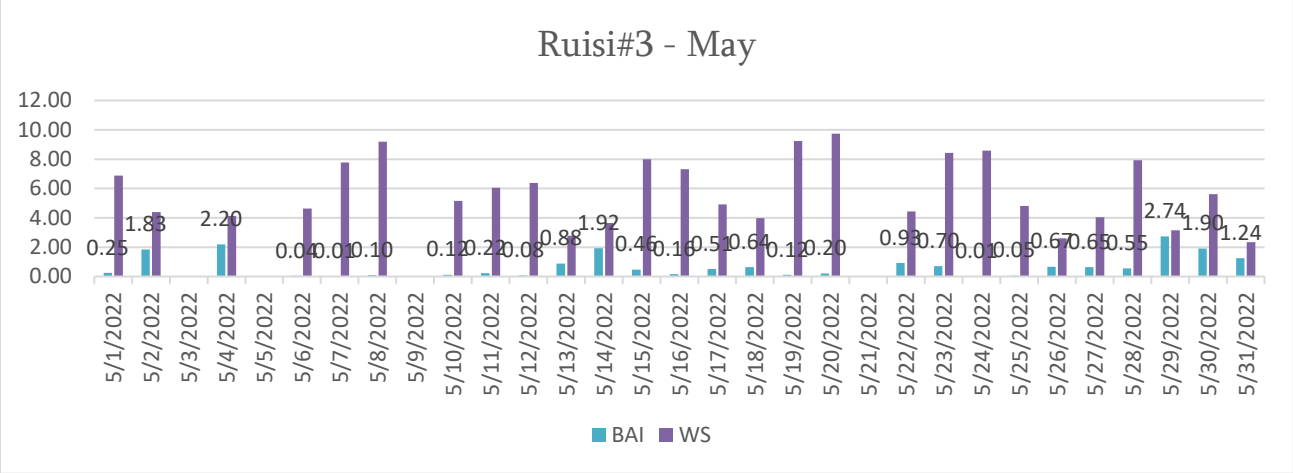


Figure #32. BAI by nights for Ruisi#3 Passive bat detector

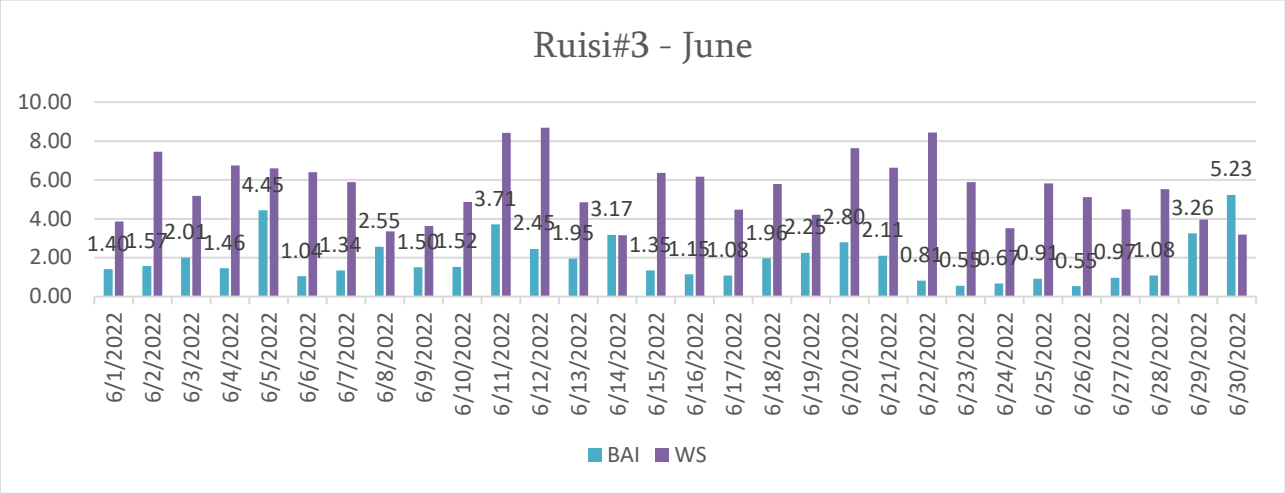


Figure #33. BAI by nights for Ruisi#3 Passive bat detector

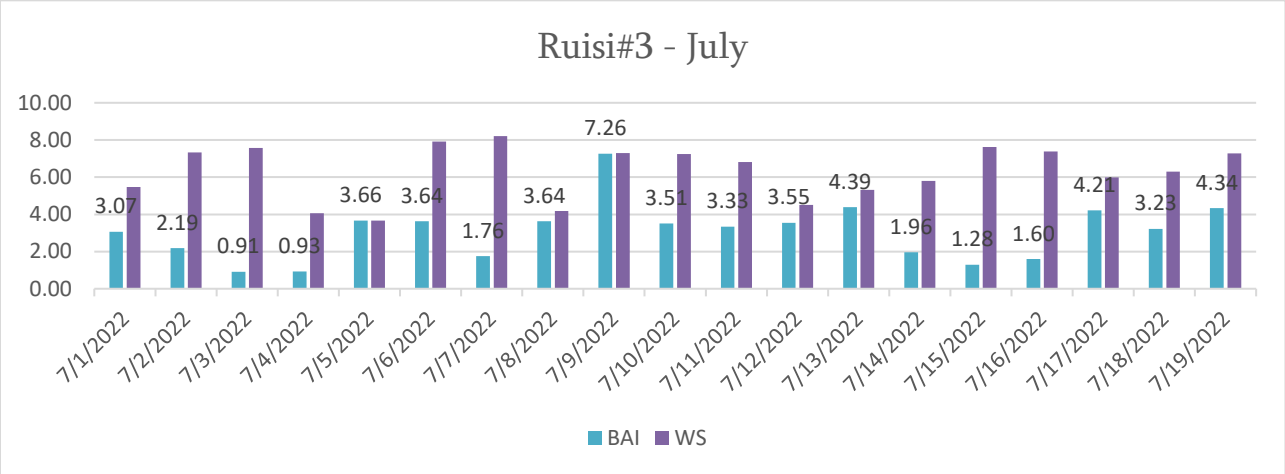


Figure #34. BAI by nights for Ruisi#3 Passive bat detector

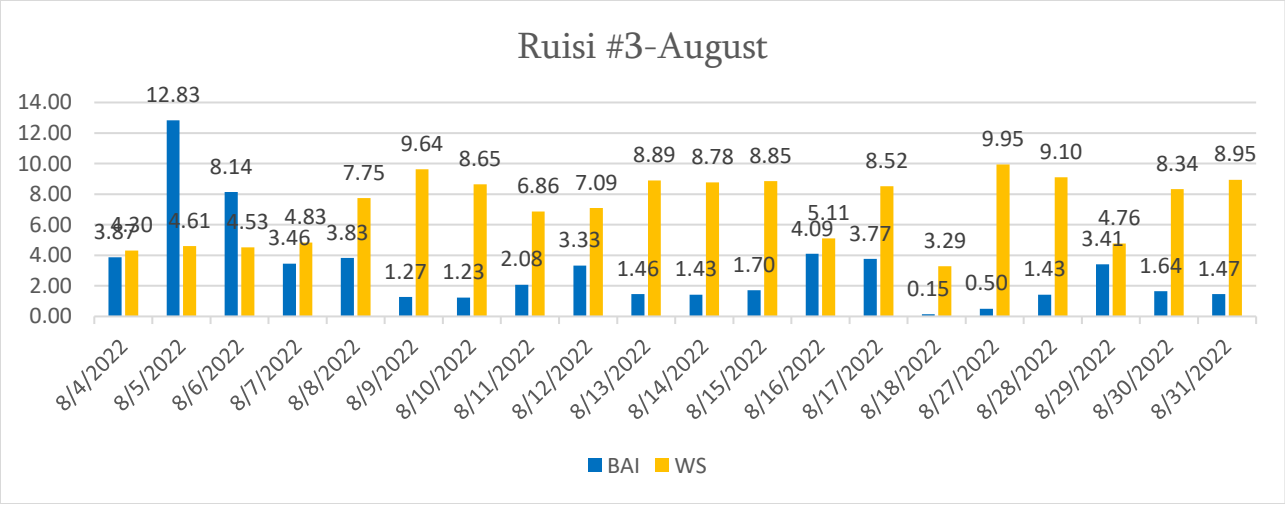


Figure #35. BAI by nights for Ruisi#3 Passive bat detector

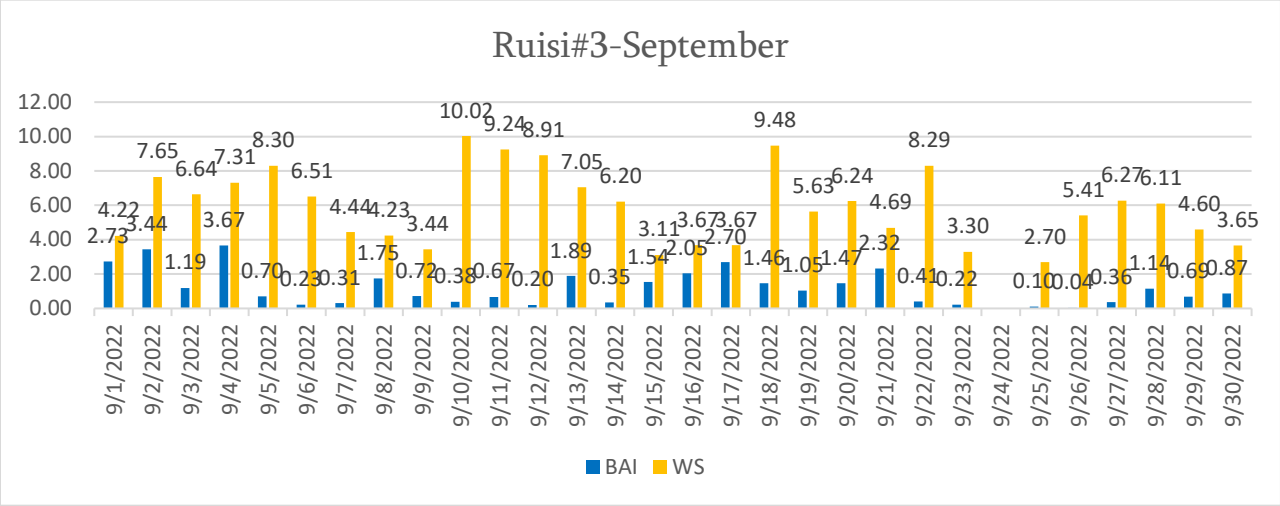


Figure #36. BAI by nights for Ruisi#3 Passive bat detector

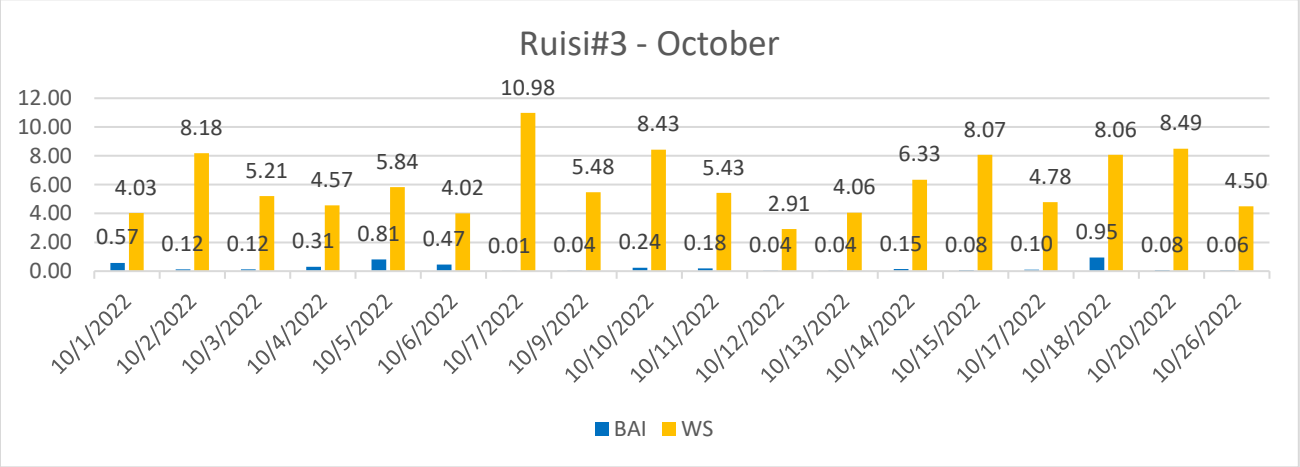


Figure #37. BAI by nights for TREE Passive bat detector

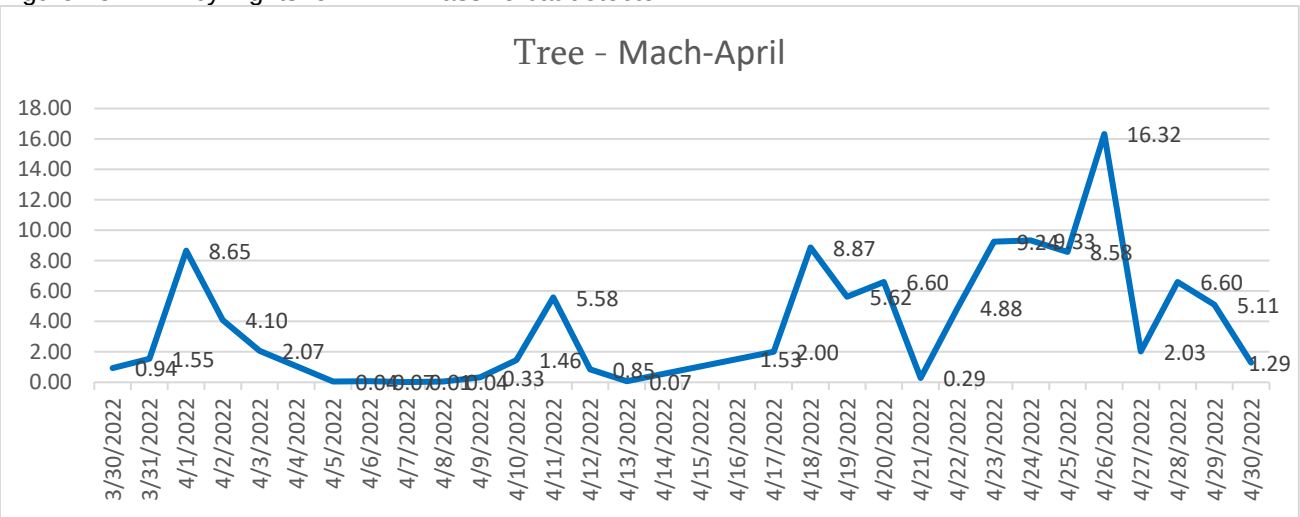


Figure #38. BAI by nights for TREE Passive bat detector

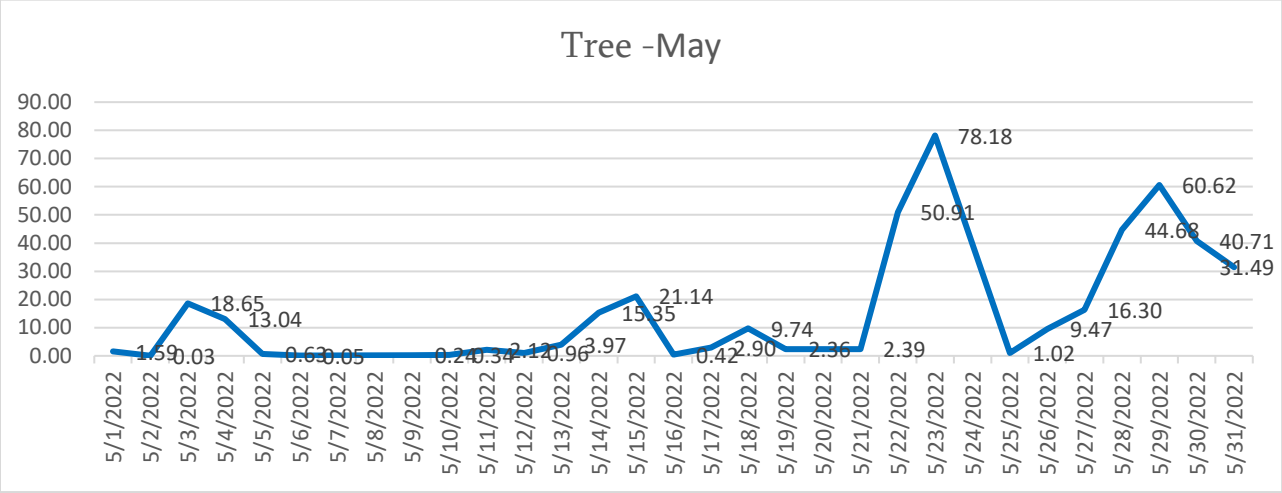


Figure #39. BAI by nights for TREE Passive bat detector

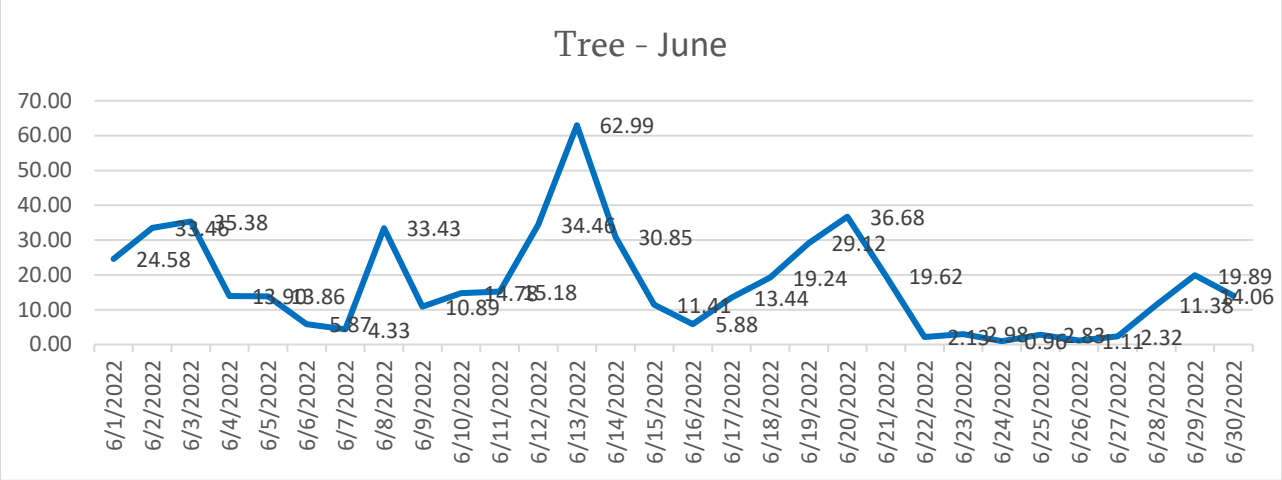


Figure #40. BAI by nights for TREE Passive bat detector

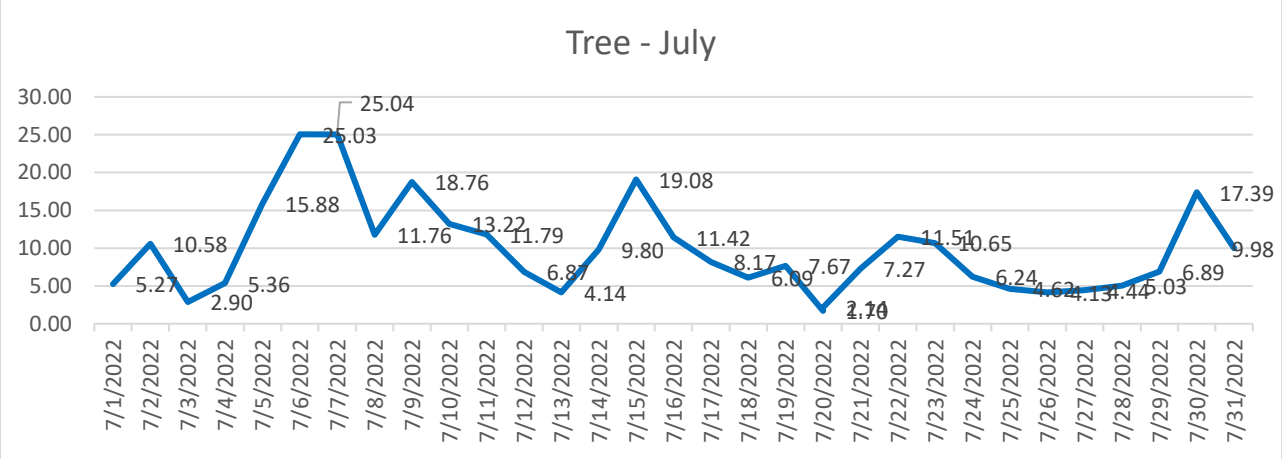


Figure #41. BAI by nights for TREE Passive bat detector

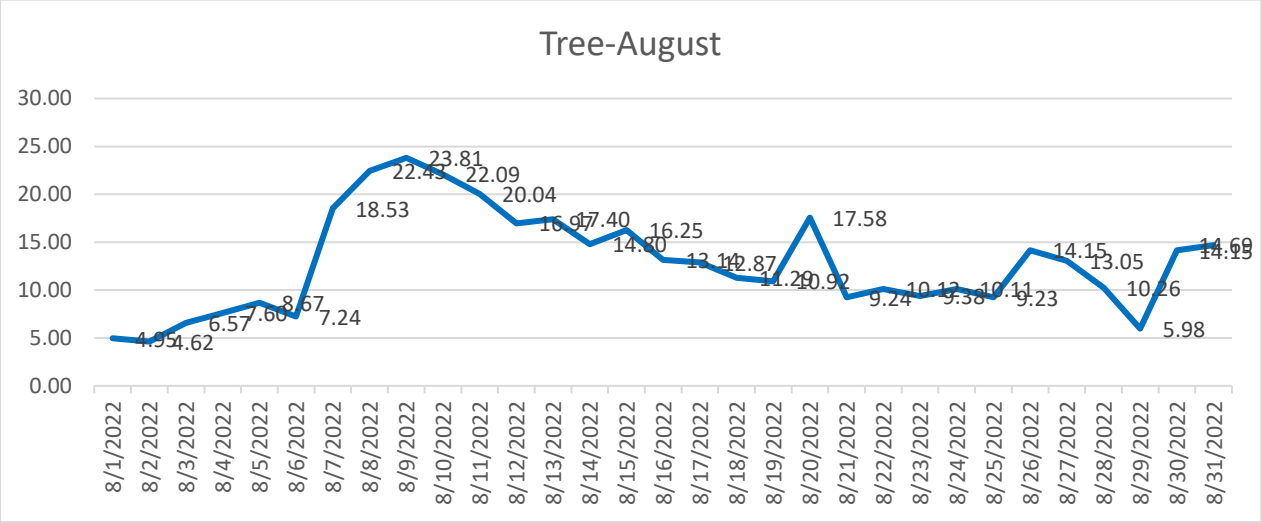


Figure #42. BAI by nights for TREE Passive bat detector

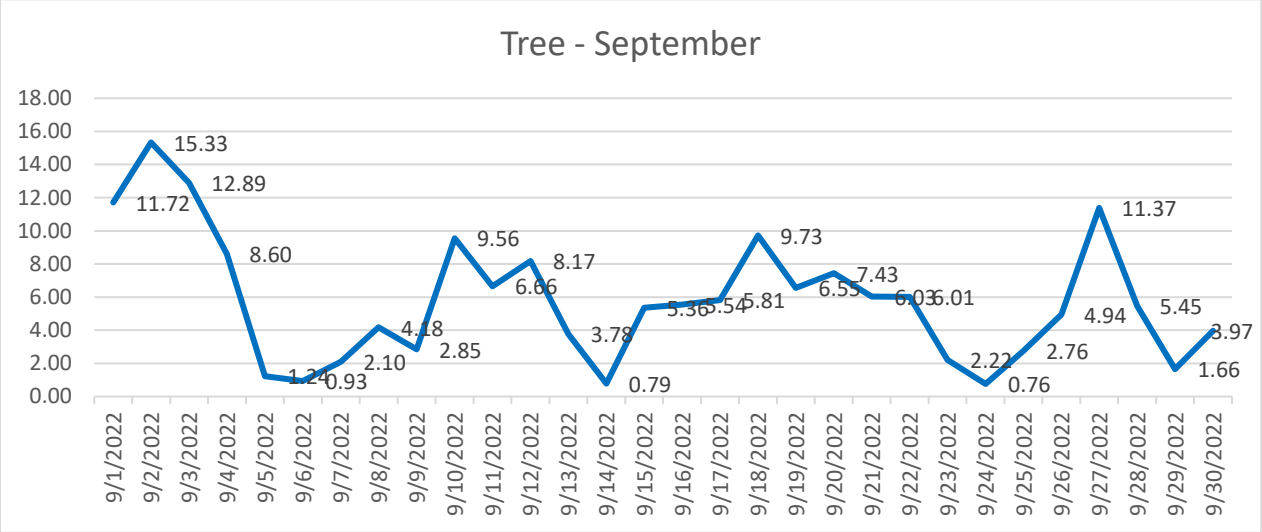
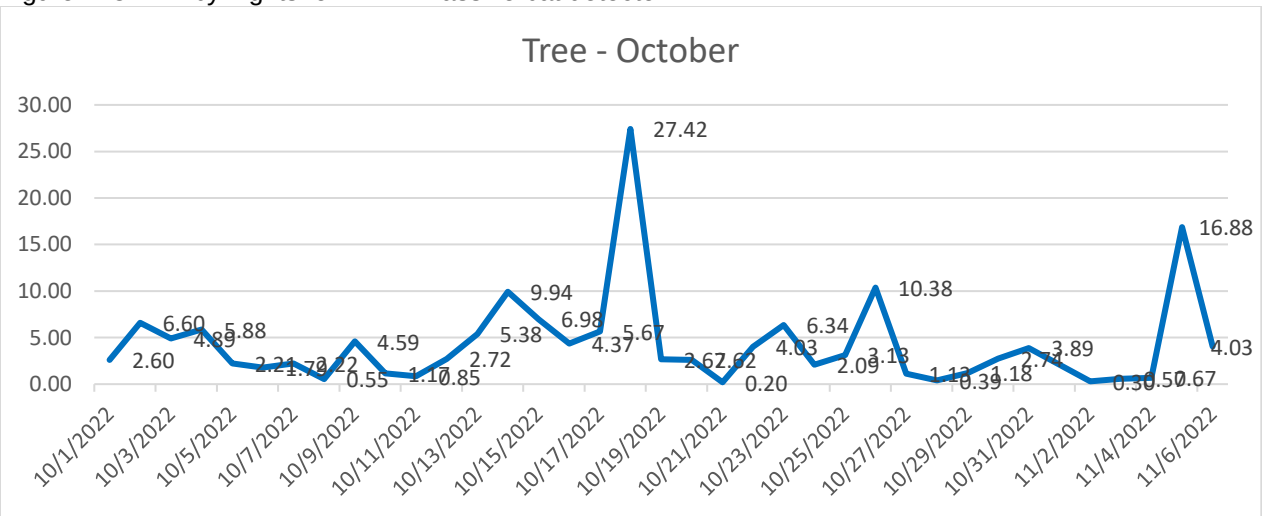


Figure #43. BAI by nights for TREE Passive bat detector



During our survey in the study polygons and on the field routes, relative bat activity was recorded at the places from Act1 through Act37, NET5 and on the coordinates - 42.09476°N/43.98746°E. Almost all areas, where relative bat activity was recorded are windbreakers with matured trees and fruit gardens. There were nights when BAI reached to such high numbers as 78.18 and 62.99 on the detector TREE. This can be explained with the following: (i)because of vegetation/trees, here there is significantly low wind and consequently, good conditions for bats in comparison to other parts of the project area; (ii) it is possible that in May, June and July hatching of insects is happening here, this attracts bats living in surrounding areas of the project territory and increases the importance of this area as foraging territory; and (iii) considering the fact that on this detector were recorded high number of Common Pipistrelle Bat (*Pipistrellus pipistrellus)* and Nathusius'/Kuhl's Pipistrelle Bat *(Pipistrellus nathusii/kuhlii),* we can suppose that small sized colony/colonies of these species can live in the farms and abandoned buildings and matured trees close to this area. Also, relative bat activity was recorded at the coordinates - 42.09476°N/43.98746°E in September and 18.10.2022. BAI reached the number 27.42 on 18 October. The increase of relative BAI in September and October close to these coordinates can be explained by the fact of seasonal movements of bats who potentially roost close to this area.

Overall, during the surveys conducted on the project area and vicinities, no bat roosts were located. Based on the results of the surveys, we can assume that the project area is used by bats for foraging/feeding and movements.

Based on the results, generally, the bat activity on most territories of the project area, except on single nights, is quite low. Also, bat activity is decreasing when wind speed is increasing. The increase of BAI during the selected night in June, July, and the beginning of August can be partially explained by the fact that during this period of time bats have youngsters and they are increasing feeding/foraging activity and cover longer distances for food. However, it should be mentioned that no maternity colony was recorded in abandoned buildings close to the project area.

Relatively high bat activities are recorded close to the wind turbines given in Table #6.

Table #6. Turbines with need of mitigation measures.

#	Old Numbers of WT	New Numbers of WT	Coordinates
1.	6	8	42.02399°N/44.00428°E
2.	32	45	42.06187°N/43.90395°E
3.	34	37	42.08097°N/43.96223°E
4.	35	29	42.04688°N/43.97047°E
5.	36	44	42.06870°N/43.90835°E
6.	37	removed from the final configuration	42.09427°N/ 43.99025°E
7.	43	34	42.10292°N/43.94450°E
8.	47	31	42.10336°N/43.96161°E
9.	50	35	42.09868°N/43.95999°E
10.	52	removed from the final configuration	42.10007°N/43.98677°E
11.	55	removed from the final configuration	42.08868°N/43.98879°E
12.	58	38	42.08291°N/43.97120°E

Close to these wind turbines, there are fruit gardens and windbreakers with mature trees, which create favorable conditions for bats.

5. Recommendations

Based on the results of the field works conducted through July, in the case of construction and operation of the wind farm, the most important recommendations at this stage are:

1. From the 10th of November through the beginning of March, wind turbines could operate without switching them off because during winter bats are not active.
2. Turbine #8 can operate without switching it of only if it is moved/relocated to the eastern direction, until the coordinates 42.02588°N/44.00978°E. It is important to consider that in such a mode of operation, the distance to the artificial pine forest should be at least 2000F[1] meters or more. Otherwise, when wind speed is below 7 m/s (measured at nacelle height) during nights without rain, it is recommended (i) increase cut-in wind speed; or (ii) feathering of blades; or (iii) shutting down. This recommendation should be also applied during drizzle weather conditions and after the period when the rain stops as bats are active during a drizzle and they start activity shortly after rain. These restrictions apply to the period 30 minutes before sunset through 30 minutes after sunrise. These turbines should be equipped with a passive bat detector as this is the recommendation for all turbines in order to observe bat activity in the surrounding areas of each turbine.
3. For the wind turbines #45, #37, #29, #44, #34, #31, #35, #24 and #38, given in table #6, when wind speed is below 7 m/s (measured at nacelle height) during nights without rain, it is recommended (i) increase of cut-in wind speed; or (ii) feathering of blades; or (iii) shutting down. This recommendation should be also applied during drizzle weather conditions and after the period when the rain stops as bats are active during a drizzle and they start activity shortly after rain. These restrictions apply to the period 30 minutes before sunset through 30 minutes after sunrise. These turbines should be equipped with a passive bat detector as this is the recommendation for all turbines in order to observe bat activity in the surrounding areas of each turbine.
4. Turbines #37alt (removed); #52alt (removed), #55 (alt. removed) #52alt (removed), #55 (alt. removed), required the same measures as in p.3, but these turbines have been removed from the final configuration.
5. During the blooming season, the following limitations of operations apply to those wind turbines planned to be located in fruit gardens and in their close vicinities: when wind speed is below 7 m/s (measured at nacelle height) during nights without rain, it is recommended (i) increase of cut-in wind speed; or (ii) feathering of blades; or (iii) shutting down. This recommendation should be also applied during drizzle weather conditions and after the period when the rain stops as bats are active during a drizzle and they start activity shortly after rain. These restrictions apply to the period 30 minutes before sunset through 30 minutes after sunrise. These turbines should be equipped with a passive bat detector as this is the recommendation for all turbines in order to observe bat activity in surrounding areas of each turbine.
6. All other turbines can operate without switching them off due to almost no activity close to these turbines. However passive bat detectors should be installed on the wind turbines to measure BAI and develop relevant mitigation measures if/as needed.
7. Maximally avoid artificial lightening, use it where and when necessary. In the wind farm area should use lightings that do not attract insects (using lights with a reduced amount of blue and UV, increased amount of red in the spectrum) and direct downward light flux toward the area of need to light. Use a shielded lighting-unit that does not emit lights above the horizontal. Avoid lamps emitting wave-length below 540nm and with a correlated color temperature more than 2700K.
8. The nacelles should be made inaccessible for bats as much as technically possible and feasible.
9. It is recommended to avoid the development of bushes and wetlands under the wind power turbine.

[1]This distance should be calculated as "the shortest straight line distance between a given point or line and the horizontal circle with a center at the wind turbine tower axis and a radius equal to the turbine blade length" (EUROBATS Publication Series No. 6, page 79).

10. Passive bat detectors should be installed on the wind turbines to measure BAI for each turbine and then, based on particular results, develop the relevant recommendations for the operation of each turbine on the project sites.
11. Maximally avoid or put limitations on cutting trees.
12. If cutting the trees is unavoidable and necessary for wind power plant construction and safe operation, the tree-cutting activity should be done according to the following steps: (i) to select those trees which should be cut; (ii) check these selected trees by bats-specialist on the potential roost-occurrence and mark those trees which will be considered as potential roosts for bats; (iii) Marked potential roost-trees are not allowed to cut from 20 May until 15 August and from 1 December until the end of February, and bats-specialist should attend cutting of marked potential roost-trees in the allowed period of time. If the roosting bats occur in the cut trees, immediate measures need to be taken to identify alternative roosts for these individuals or colonies; and (iv) non-marked trees can be cut any time during the year.
13. To consult with a bat specialist if during the tree-cutting process suddenly roosting bats occur in the cut trees.
14. Post-construction monitoring should be carried out as recommended by the Resolution 8.4 adopted at the 8th meeting of parties of the Agreement on the Conservation of Populations of European Bats (EUROBATS).
15. Continue post-construction monitoring and mitigation measures as long as needed to guarantee the effectiveness of mitigation measures.

The recommendations provided in the given midterm report might be revised, further developed and/or adapted taking into consideration the results post-construction monitoring.

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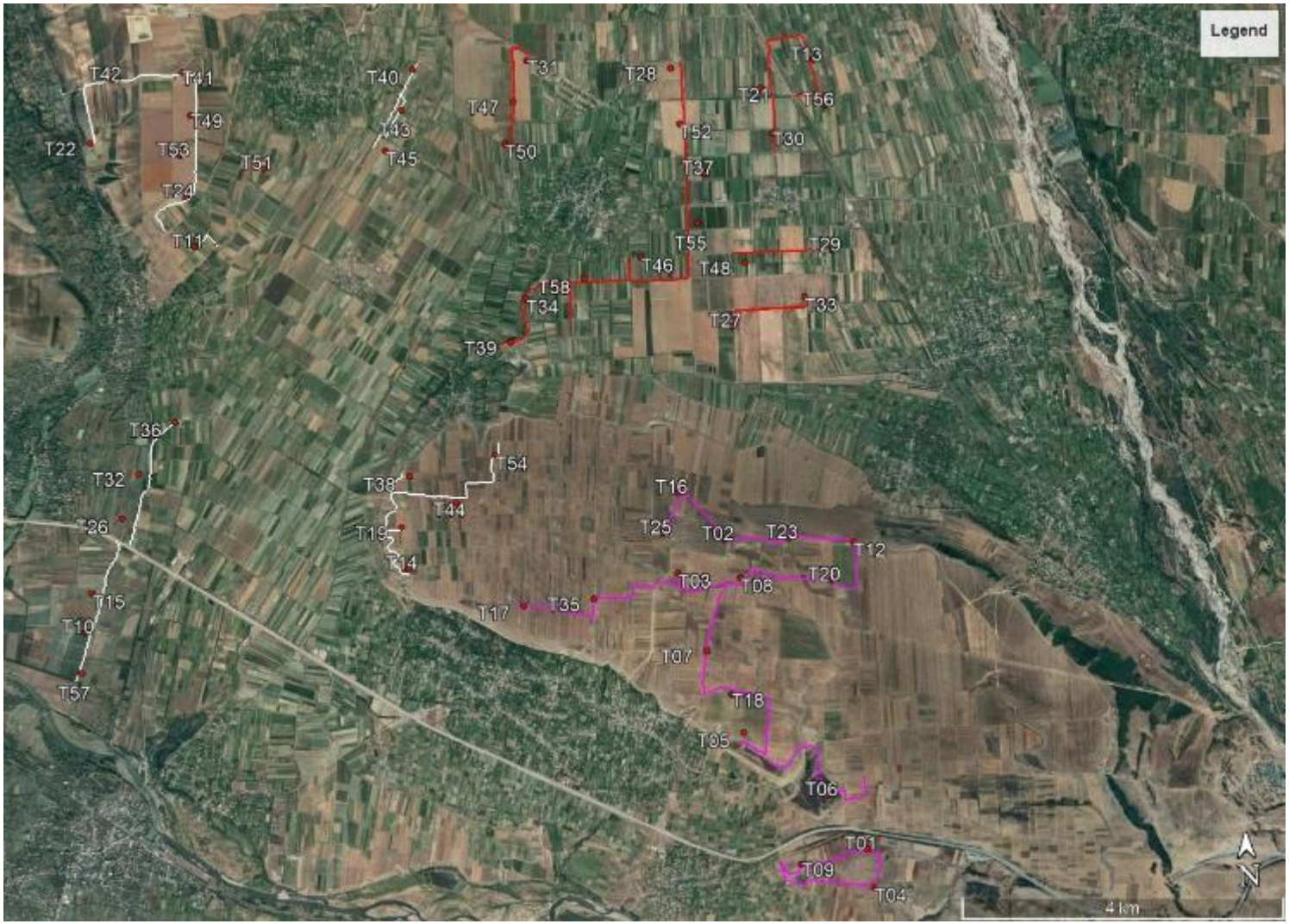
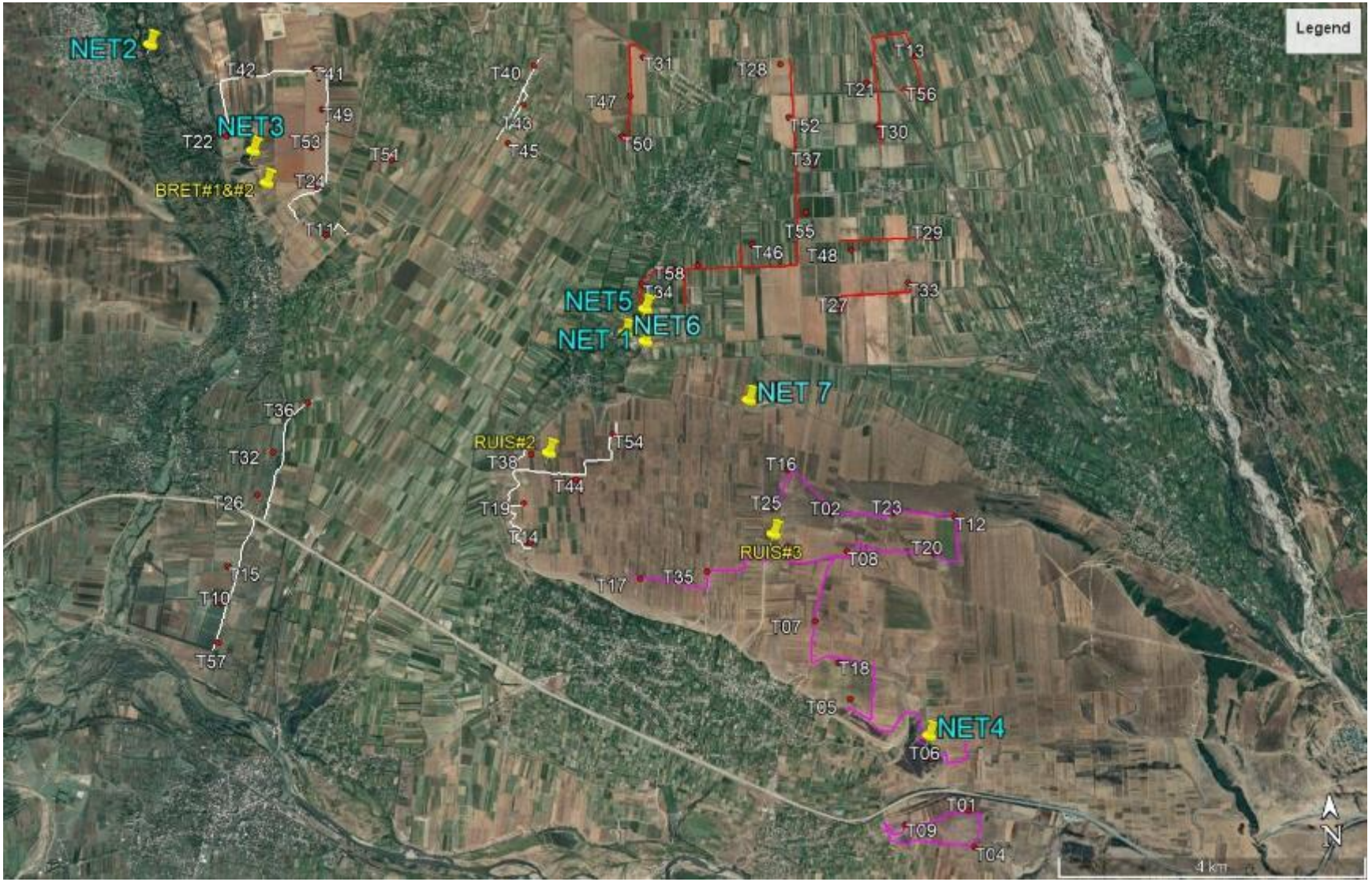
Annex 1 - Maps

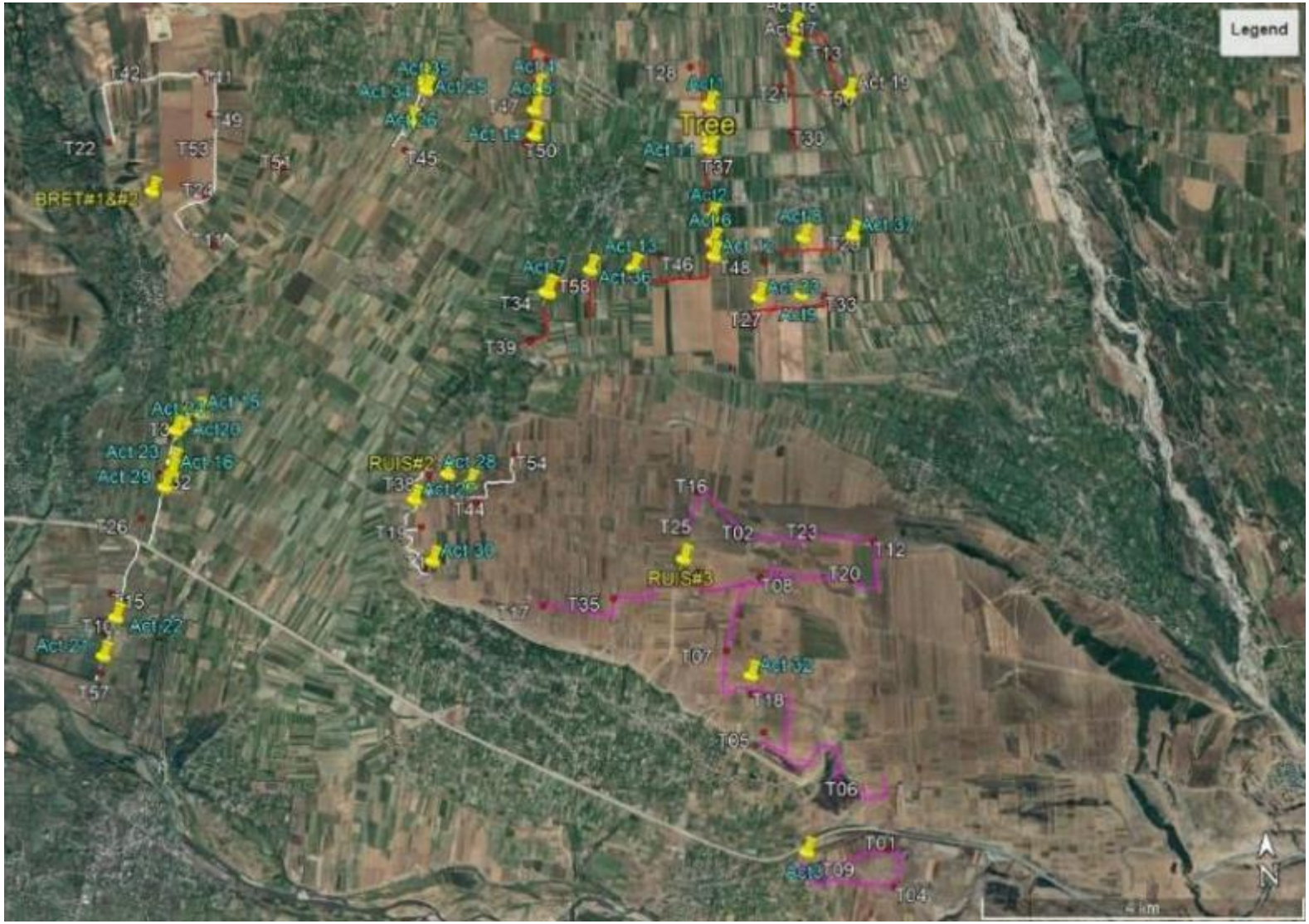
Map #1. Project area and field routes



Map #2. Field routes and mist netting areas



Map #3. Field routes and areas with relatively high bat activity



Annex 2 - Short scientific names of bats species

BARBAR	*Barbastella barbastellus*
EPTSER	*Eptesicus serotinus*
HYPSAV	*Hypsugo savii*
NYCLAS	*Nyctalus lasiopterus*
NYCLEI	*Nyctalus leisleri*
NYCNOC	*Nyctalus noctula*
PIPNAT	*Pipistrellus nathusii*
PIPKUH	*Pipistrellus kuhlii*
PIPPIP	*Pipistrellus pipistrellus*
PIPPYG	*Pipistrellus pygmaeus*
RHIFER	*Rhinolophus ferrumequinum*
VESMUR	*Vespertilio murinus*
NYCsp	*Nyctalus sp*
MYOsp	*Myotis sp*
PLEsp	*Plecotus spp*

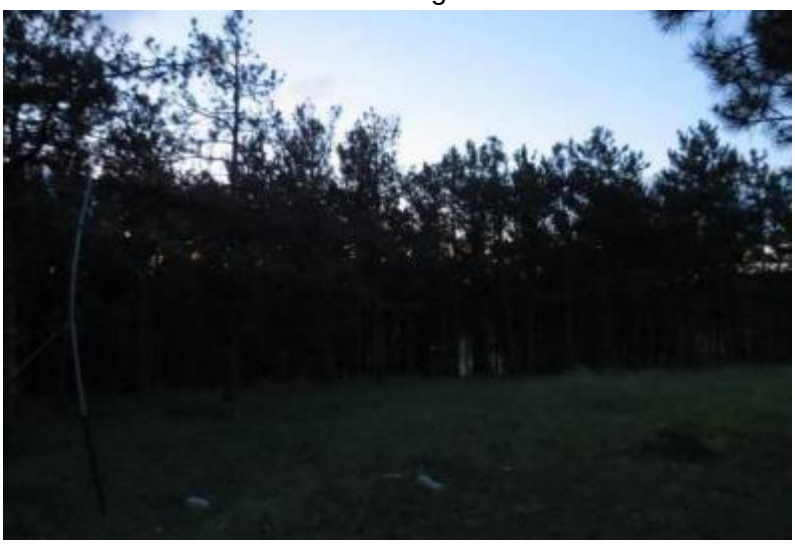
Annex 3 – Photos

Pic #1. Working process

Pic #2. Mist netting area - NET1

Pic #3. Mist netting area on the river Prone - NET2

Pic #4. Mist netting area NET3



Pic #5.Mist netting area NET4

Pic #6. Mist netting area NET5

Pic. 7. Working process

Pic. 8. Working process

Pic. 9. Working process

Pic. 10. Project area

Pic. 11. Project area

Pic. 12. Project area

Pic. 13. Project area

Pic. 14. Project area

Pic. 15. Project area

Pic. 16. Project area

Pic. 17. Project area

Pic. 18. Project area

Pic. 19. Project area

Pic. 20. Project area

Pic. 21. Project area

Pic. 22. Project area

Pic. 23. Project area

Pic. 24. Project area

Pic. 25. Project area

Pic. 26. Project area

Pic. 27. Project area

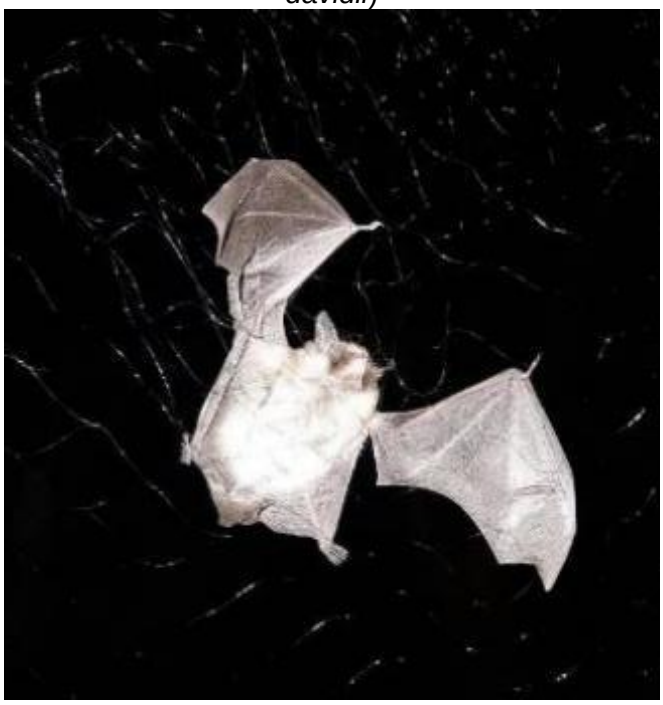
Pic. 28. Project area

Pic. 29. Project area

Pic. 30. Project area

Pic 31. Mist netting area NET6

Pic. 32. David's Mouse-eared bat (*Myotis davidii*)



Pic. 32. David's Mouse-eared bat (*Myotis davidii*)

Pic. 34. Mist netting area NET7

Annex 5. Bird Survey Reports

Introduction

The Bird Survey program envisages 1 full season of observations. The program started in autumn of 2021 and comprises four seasonal surveys. The outcome will be presented as four interim reports (autumn 2021; winter, spring and summer of 2022) and one summarizing Survey Report.

December 27, 2022
REPORT
TO JSC Wind Power

SUMMARY REPORT

ON THE ORNITHOLOGICAL MONITORING CARRIED OUT AT THE 206 MW Ruisi WIND POWER PLANT PROJECT AREA DURING AUTUMN 2021 – SUMMER 2022

1. Objectives of Ornithological Monitoring

Complete Ornithological Report is given in ESIA volume II,. Below we provide a summary of this report.

The main objective of the survey was to collect baseline data on patterns of the spring transit migration of birds within the limits of the 206 MW Ruisi WPP Project Area and in adjacent areas.

The specific objective of the study was to obtain information on the composition of spring passage visitors, their status of presence, territorial distribution, habitat selection, numbers of presented individuals, or densities, of solitary birds species, flight activity during wintering in the study area, dates of the presence and some other aspects of spring Avifauna of area under consideration.

When studying the ornithological situation within the project, special attention was paid to the target species. Traditionally, these bird species types are species listed in the EU Bird Directive annex 1, global and national red lists, all large-sized soaring birds, etc. Within the 206 MW Ruisi WPP Project Area, all birds of prey, owls and quail were found to be such species. They were chosen as targets species – 23 target bird species: 19 raptor species, 3 owl species and quail.

2. Materials, methods and Schedule

2.1 Survey Scheme and Schedule

The complex study of ornithological situation within the limits of 206 MW Ruisi WPP Project Area carried all seasons of years 2021 – 2022 between October 6, 2021 and September 27, 2022. Field work carried in all parts of area under consideration as well as in adjacent areas. Data collected in all periods of year – during breeding of birds, their seasonal migrations in autumn and spring and wintering. The duration of field work according to the seasons of year was as follows: 8 days (around 79 hours) – in the autumn 2021; 8 days (66 hours and 05 minutes) - in the winter 2022; 20 days (202 hours and 30 minutes) - in the spring 2022; 21 days (228 hours and 30 minutes) – in the summer 2022; 12 days (132 hours and 20 minutes) - in the autumn 2022.

The total duration of field work during 89 calendar/working days was 708 hours and 25 minutes, which is quite enough for such a relatively small area as the Ruisi WPP Project Area. But it should be noted that the real time of direct observations is much longer and amounts to more than 794 hours (794 h 25 min). This is explained by fact that on some days the observations were carried out from two different vantage points (watching posts) by two or in some cases by three observers, the total duration was more.

Field works in 2021 - 2022 were carried out by professional ornithologist/zoologist - Dr. Alexander Abuladze from the Institute of Zoology, Ilia State University in co-operation with one or two assistant(s) and assistant/drivers and in some cases in assistance with amateur birdwatchers (Figure).

Field work were carried in all seasons of years 2021 – 2022 (between October 6, 2021 and September 27, 2022) during the periods of the breeding of birds, seasonal transit migrations in autumn and spring and wintering.

April 1, 2022

July 15, 2022

September 21, 2022

Figure 1. Surveyors on the ornithological monitoring

Detailed information indicating the dates, times and duration of field work by day is presented in all seasonal-quarterly reports.

Below, in the form of a list, data on the dates and duration of field work for individual seasons of the year are presented:

Autumn 2021

The ornithological data collecting within the limits of the 206 MW Ruisi Wind Power Plant Project Area as well as in adjacent areas were undertaken during nine calendar/ working days from October 6 and October 26, 2021:

- October 6, 2021 – from 10:10 to 20:20 (10 hours and 10 minutes);
- October 9, 2021 – from 10:45 to 20:15 (9 hours and 30 minutes);
- October 11, 2021 –from 09:40 to 19:50 (10 hours and 10 minutes);
- October 15, 2021 – from 10:30 to 19:15 (8 hours and 45 minutes);
- October 18, 2021 – from 09:20 to 18:10 (8 hours and 50 minutes);
- October 20, 2021 – from 10:50 to 18:00 (7 hours and 10 minutes);
- October 22, 2021 - from 14:15 to 20:00 (5 hours and 45 minutes);
- October 24, 2021 – from 08:00 to 19:50 (11 hours and 50 minutes);
- October 26, 2021 – from 12:55 to 19:45 (6 hours and 50 minutes);

The total duration of the autumn 2021 fieldwork carried out at the 206 MW Ruisi WPP Project Area in October 2021 comprised 79 hours

Winter 2022

Field works planned for the Ornithological Monitoring of wintering birds for the Ruisi WPP Project Area comprised eight calendar/ working days of winter 2022. Specific dates and duration of observations during each day are as follows:

- January 20, 2022; from 11:15 to 17:10 (5 hours and 55 minutes);
- January 24, 2022; from 09:20 to 17:45 (8 hours and 25 minutes);
- January 29, 2022; from 09:30 to 17:40 (8 hours and 10 minutes);
- January 31, 2022; from 09:15 to 17:00 (7 hours and 45 minutes);
- February 2, 2022; from 10:45 to 18:00 (7 hours and 15 minutes);
- February 5, 2022; from 09:00 to 17:45 (8 hours and 45 minutes);
- February 10, 2022; from 09:15 to 17:30 (8 hours and 15 minutes);
- February 14, 2022; from 08:40 to 18:15 (9 hours and 35 minutes).

The total duration of the winter 2022 Ornithological Monitoring carried out in January/February 2022 comprised 66 hours and 05 minutes.

Spring 2022

Field works carried out during the Ornithological Monitoring for the Ruisi WPP Project Area comprised 21 (twenty-one) calendar/ working days of spring 2022. Specific dates and duration of observations during each day are as follows:

- April 1, 2022; from 09:50 to 17:10 (7 hours and 20 minutes);
- April 3, 2022; from 08:15 to 17:50 (9 hours and 35 minutes);
- April 6, 2022; from 08:10 to 18:00 (9 hours and 50 minutes);
- April 9, 2022; from 08:00 to 18:50 (10 hours and 50 minutes);
- April 11, 2022; from 08:15 to 18:30 (10 hours and 15 minutes);
- April 14, 2022; from 09:20 to 19:00 (9 hours and 40 minutes);
- April 18, 2022; from 08:30 to 18:45 (10 hours and 15 minutes);
- April 21, 2022; from 07:15 to 18:50 (11 hours and 35 minutes);
- April 24, 2022; from 07:45 to 18:55 (11 hours and 10 minutes);
- April 26, 2022; from 10:20 to 20:30 (10 hours and 10 minutes);
- April 28, 2022; from 08:30 to 20:45 (12 hours and 15 minutes);
- May 3, 2022; from 07:10 to 19:50 (12 hours and 40 minutes);
- May 7, 2022; from 18:15 to 23:50 (5 hours and 35 minutes);
- May 11, 2022; from 08:10 to 18:50 (10 hours and 40 minutes);
- May 13, 2022; from 08:30 to 19:45 (11 hours and 15 minutes);
- May 16, 2022; from 09:15 to 19:25 (10 hours and 10 minutes);
- May 17, 2022; from 08:10 to 20:20 (12 hours and 10 minutes);
- May 19, 2022; from 10:30 to 23:20 (12 hours and 50 minutes);
- May 22, 2022; from 07:30 to 17:45 (10 hours and 15 minutes);
- May 25/26, 2022; from 14:20 (May 25) to 04:40 (May 26), 2022; (14 hours and 20 minutes)

The total duration of the spring 2022 Ornithological Survey carried out in April / May

2022 comprised 202 hours and 30 minutes, but taking into account the fact that on several days the observations were carried out from two different vantage points (watching posts) by two or three observers, the total duration 212 hours and 40 minutes.

Summer 2022

Field works carried out during the summer 2022 Ornithological Monitoring for the Ruisi WPP Project Area comprised 21calendar/ working days. Specific dates and duration of observations during each day are as follows:

- June 3/4, 2022; from 22:10 to 02:30 (4 hours and 20 minutes);
- June 5, 2022; from 07:40 to 19:50 (12 hours and 10 minutes);
- June 7, 2022; from 07:30 to 21:15 (13 hours and 45 minutes);

- June 9, 2022; from 08:00 to 19:45 (11 hours and 45 minutes);
- June 11, 2022; from 06:50 to 20:30 (13 hours and 40 minutes);
- June 13, 2022; from 08:15 to 19:30 (11 hours and 15 minutes);
- June 15, 2022; from 07:20 to 19:50 (12 hours and 30 minutes);
- June 18, 2022; from 06:30 to 20:45 (14 hours and 15 minutes);
- June 20, 2022; from 07:45 to 20:00 (12 hours and 15 minutes);
- June 22, 2022; from 07:10 to 21:15 (14 hours and 5 minutes);
- June 25, 2022; from 08:40 to 20:50 (12 hours and 10 minutes);
- June 27/28, 2022; from 20:45 to 03:15 (6 hours and 30 minutes);
- June 29, 2022; from 07:30 to 19:50 (12 hours and 20 minutes);
- July 1, 2022; from 08:10 to 20:15 (12 hours and 5 minutes);
- July 3, 2022; from 07:00 to 21:10 (14 hours and 10 minutes);
- July 5, 2022; from 06:00 to 20:40 (14 hours and 40 minutes);
- July 7, 2022; from 08:15 to 19:50 (11 hours and 35 minutes);
- July 9, 2022; from 07:50 to 20:30 (12 hours and 40 minutes);
- July 10/11, 2022; from 21:30 to 03:45 (6 hours and 15 minutes);
- July 12, 2022; from 07:30 to 20:00 (12 hours and 30 minutes);
- July 14/15, 2022; from 22:30 (July 14) to 04:45 (July 15), 2022; (6 hours and 15 minutes);
- July 15, 2022; from 08:20 to 16:30 (8 hours and 10 minutes);

The total duration of fieldwork conducted in summer 2022 was 255 hours and 20 minutes.

Autumn 2022

Field works carried out during the autumn 2022 Ornithological Monitoring for the Ruisi WPP Project Area comprised 12 calendar/ working days. Specific dates and duration of observations during each day are as follows:

- September 10, 2022; from 08:40 to 20:00 (11 hours and 20 minutes);
- September 11, 2022; from 07:20 to 20:40 (13 hours and 20 minutes);
- September 12, 2022; from 07:50 to 19:40 (11 hours and 50 minutes);
- September 14, 2022; from 07:30 to 19:50 (12 hours and 20 minutes);
- September 15, 2022; from 07:10 to 20:00 (12 hours and 50 minutes);
- September 16, 2022; from 07:15 to 20:30 (13 hours and 15 minutes);
- September 18, 2022; from 08:00 to 18:15 (10 hours and 15 minutes);
- September 19, 2022; from 08:10 to 19:30 (11 hours and 20 minutes);
- September 20, 2022; from 08:50 to 19:00 (10 hours and 10 minutes);
- September 21, 2022; from 09:45 to 20:00 (10 hours and 15 minutes);
- September 23, 2022; from 08:15 to 18:30 (10 hours and 30 minutes);
- September 24, 2022; from 08:45 to 18:30 (9 hours and 45 minutes);
- September 27, 2022; from 09:10 to 19:40 (10 hours and 30 minutes);
- October 1, 2022, from 11:15 to 19:00 (7 hours and 45 minutes);

In total 155 hours and 25 minutes were spent for the Ornithological Monitoring carried within the limits of 206 MW Ruisi WPP Project Area in autumn 2022. But taking into account the fact that on some days the observations were carried out from two vantage points (watching posts) by two observers, the total duration was 181 hours and 20 minutes.

2.2 Survey Methodology

Field work were conducted in more-or-less favourable, suitable, weather conditions, optimal for visual observations and identification of bird species, i.e. not during periods of strong winds, snowfalls and heavy rains.

The factual data were collected using the combination of traditionally used methods:

- Direct visual observations from vantage (watching) point located at the high point of relief
- Survey on foot
- Road-car survey across and around area under consideration.
- Using of playbacks for monitoring of nocturnal bird species, or species with night activity

Of course, not all these listed methods were equally applied. In different parts of study area and depending on the specific weather conditions of a particular day and time of day, priority was given to the most useful method or to combination of different methods. But always the basic method was direct visual observations from vantage point in combination with survey on foot.

Vantage point Survey

The vantage point survey methodology follows the one described in the international best practice "Scottish Natural Heritage - Guidance. Recommended bird survey methods to inform impact assessment of offshore wind farms; March 2017, Version 2".

Several vantage points were selected for direct visual observations during field work – two in the autumn 2021, one in the winter 2022, four in the spring 2022, three in the summer 2022 and three in the autumn 2022. The location of all vantage points with coordinates is shown on maps in the seasonal/quarterly reports (Figure).

Vantage point during winter survey; January 24, 2022.

Vantage Point No 1 during spring survey; April 21, 2022

Vantage Point No 2 during autumn survey; September 11, 2022

Figure 2. Vantage point surveys in different seasons

All vantage points were located at high points of relief with optimal conditions for direct visual observations. From the all vantage points, a very good view of the main parts of project area and some sides of the adjoining territories opened up. In good weather, visibility from the vantage points was up to the horizon, which allowed us to see flying birds from a distance of 3 – 5 km and more.

The total duration of direct visual observations carried from vantage points was more than 495 hours (495 hours and 5 minutes): 42 hours and 50 minutes in the autumn 2021; about 17 hours in the winter 2022; 178 hours and 30 minutes in the spring 2022 [77 hours and 20 minutes from VP No 1, 41 hours and 50 minutes from VP No 2, 40 hours and 10 minutes from VP No 3, 19 hours and 10 minutes from VP No4]; 118 hours and 25 minutes in the summer 2022 [42 hours and 25 minutes from VP No 1, 39

hours and 50 minutes from VP No 2, 36 hours and 10 minutes from VP No 3] and 138 hours and 20 minutes in the autumn 2022 [48 hours and 50 minutes from VP No 1, 46 hours and 45 minutes from VP 2, 42 hours and 45 minutes from VP No 3].

Survey on foot

Survey on foot across all parts/sections of the Ruisi WPP Project Area as well as in adjacent areas carried out by two surveyors – expert and assistant, in some cases together with assistant/driver (Figure). Usually surveys on foot conducted throughout the daylight hours, usually in favourable weather conditions, optimal for visual observations.

Figure 3. Ornithological survey on foot in different seasons

Road-car Survey

Another additional method was road-car survey in open habitats with field glasses from a moving car across and around study area. Road-car surveys were carried out with a series of frequent short stops from 5 to 30 minutes, around hours in total. Stops were made mostly in high points or relief with optimal conditions for visual observations with binoculars or telescope. Car 4 x 4 "Nissan xTerra" was used for road-car survey (Figure).

The total duration of survey on foot and road-car survey was more than 213 hours (213 hours and 20 minutes.

Vehicle used for the road-car survey

Road-car survey in the central part of study area; June 29, 2022

Figure 4. Road-car survey across and around the study area

Using of Playbacks for nocturnal birds survey

The monitoring of nocturnal bird species, or species with night activity was conducted using of playbacks (Figure). Nocturnal bird surveys were done in good weather conditions on calm nights. A total of 23 hours and 20 minutes of night surveys were carried out in 2022 during breeding of owls:

- June 3/4, 2022; from 22:10 to 02:30 (4 h and 20 min);
- June 27/28, 2022; from 20:45 (June 27) to 03:15 (June 28); (6 h and 30 min);
- July 10/11, 2022; from 21:30 (July 10) to 03:45 (July 15); (6 h and 15 min);
- July 14/15, 2022; from 22:30 (July 14) to 04:45 (July 15); (6 h and 15 min);

Figure 5. Nocturnal bird survey; June 27, 2022.

2.3 Used Equipment

During the field work carried out in 2021 – 2022 at the 206 MW Ruisi WPP Project Area, the equipment necessary to obtain full-fledged results was used to collect factual materials (Figure).

Figure 6. The surveyor equipped for the bird monitoring

Various binoculars, telescopes, photo cameras photo cameras, lenses and some other equipment used during field works in October 2021:

Identification of birds was through various binoculars “Leica Trinovid 8 x 42 BA” and “Nikon Aculon 10 x 50”, binocular “Nikon Action 10 x 50”and in some cases during road-car surveys through “Pentax 8 x 25” (Figure). Besides that, binocular-cam “Trust 8 x 42”, telescope “Bushnell” 20x-60x60mm Coated Optics Adjustable Focus Spotting Scope, telescope 15-45X65 NITRO TM Spotting Scope and telescope “Sibir 20x - 50x” were used.

Binocular “Nikon Aculon 10 x 50”

Binocular “Pentax 8x42”

Figure 7 Binoculars used for the bird observation

The rangefinders, optical rangefinder and laser rangefinder, were used to determine the flight height of birds, especially at high altitudes exceeding 100 m. If the flight altitude of individual individuals in migratory flocks was determined, then attention was focused on the extreme heights - minimum and maximum. The disadvantage of using rangefinders is that they provide accurate data when the bird is directly at its zenith. Low heights usually were determined visually. The following rangefinders used:

- Optical Rangefinder “Newcon LRM 1200 - 7x25”
- Laser Rangefinder "Vortex Ranger 1800"
- Laser Rangefinder “Leupold RX-1000” (Figure)

Figure 8. Laser Rangefinder “Leupold RX-1000”

Various photo cameras, lenses and additional devices were used during field works in 2021-2022 (Figure):

- photo camera “Nikon D5600”,
- photo camera “Nikon COOLPIX P900”,
- photo camera “Nikon P610”, photo camera “Canon PowerShot A2400 IS”,
- photo camera “Sony DSC TX1”,
- photo camera “Fujifilm FinePix XP70”,
- lens AF Zoom-NIKKOR 70-300mm f/4-5.6G,
- lens “Sigma” 150-600mm F5-6.3 DG OS HSM
- Bluetooth speaker with collection of MP 3 bird sounds (Figure)
- GPS receiver “Garmin etrex” with entered coordinates of vantage points, counting routes, borders of study area, etc. (Figure)
- Complect of the Walkie Talkie Radio 2 Two Way PMR 446 Midland G5 XT Long Range (Figure)

Figure 9. Photo cameras and lenses used during field works

Figure 10 Use of the bluetooth speaker for collection of bird sounds

Figure 11. GPS receiver "Garmin etrex"

Figure 12. Walkie Talkie Radio 2 Two Way PMR 446 Midland G5 XT Long Range

The following additional equipment was use during field works:

- Olympus WS-853 Digital Voice Recorder
- various tripods for optical equipment
- Camouflage tent used during observations from vantage point
- Folding table, chairs, awning to protect from the sun and rain, etc.
- Set of maps with drawn points
- Collected data forms
- Compass
- personal field equipment - warm clothes and shoes
- Various Bird Guides (Figure)

Figure 13. Used bird guides

3. 3. Results of Ornithological Survey

1. 3.1 Known Data on the Avifauna of the Ruisi WPP Project Area

The scientific ornithological issues dedicated to the Avifauna with detailed information on the separate bird species distribution, habitat selection, their numbers and densities within the limits of the area under consideration, breeding biology, seasonal transit migrations, wintering, local movements, etc. are very scarce. It should be noted that the level of general knowledge on the Avifauna and ornithological situation within the limits of Ruisi WPP Project Area is very low and incomplete. Unfortunately, there are no historical or modern published data on the detailed characteristics of Avifauna of the Project Area. The exceptions are only several short communications, published by Prof. Dr. Gia Edisherashvili working in the Gori State University, but they provide very brief factual data on the Avifauna of Shida Kartli Region of Georgia, including territory selected for planned Ruisi WPP, i.e. the area under consideration (Edisherashvili, 1999a; 1999b; 2002; 2011.). Only two modern more-or-less detailed publications dedicated on the status of the Birds of Prey (Falconiformes) and owls (Strigiformes) in adjacent areas (at the Kvernaki Ridge) was published in 2019 (Abuladze, 2019) and in 2022 (Abuladze, 2022). It should be mentioned, that generally, the description of the Avifauna of the Ruisi WPP Project Area is based on the author's own experience and results of the surveys, executed in previous years and decades (in 1977- 1991 and later – in 1997–1999 and in 2011-2022). It is especially necessary to point out that the author of this report (Dr Alexander Abuladze) in all seasons of 2016 – 2018 carried out a complex study of the ornithological situation and conducted seasonal monitoring work within the limits of Gori WPP, the territory of which is closely adjacent to the eastern border of the Ruisi WPP Project Area. Thus consultations with colleagues-scientists and interview of locals are considered as one of valuable sources of information.

2. 3.2 Results of field work carried out in 2021 - 2022

Based on the author's own materials collected during field work carried out during the previous three decades within the limits of Project Area as well as on all available factual data about ornithological diversity of study area, the presence of at least 110 bird species was confirmed, from which about 90 bird species are more-or-less regular elements. Other birds are vagrant species or rare irregularly presented occasional elements (occasional visitors) to the local Avifauna. During field work breeding was confirmed for about 50 bird species, additionally about 10 bird species are irregular, or occasional breeders. Diversity of the bird species and numbers of each species greatly increase in spring and in autumn during seasonal transit migrations.

During the field work on this project carried out from October 6, 2021 to September 27, 2022, 97 species of birds were recorded. Additionally, in adjacent areas, at a distance of 1000 to 2000 meters from the

nearest turbines, another 17 bird species were noted that were not observed at the Ruisi WPP Project Area.

Below is information on the number of bird species in different seasons of the year, recorded during the period of field work carried out within the limits of Project Area in 2021 – 2022:

► **Systematic List of the bird species recorded during field works carried out in Ruisi WPP Project Area in from October 6, 2021 to September 27, 2022**

Systematic list of the recorded bird species with the basic information on the status of presence and conservation status of each bird species presented below.

The following (one or more) categories selected for classification of the status of bird species, which occurred within the limits of study area (keys to the List):

Status of presence:

- YR-R = year-round resident, breeding species, present throughout of all seasons of year;
- YR-V = year-round visitor, non-breeding bird, present throughout of all seasons of year;
- SB = summer breeder or breeding species, present in breeding season and absent during non-breeding period;
- SV = summer visitor; non-breeder, present in spring and summer;
- PM - passage migrant (passage visitor) - bird on regular seasonal passage, present
- WV - winter visitor, non-breeding, present in late autumn, winter and early spring;
- primarily in autumn and spring;
- OV - occasional visitor (or vagrant species) - recorded only several times; unexpected because normal distribution range is very distant from Project Area.
- ND = Not defined; found but its status not known yet.
- FB = Former breeder; breeding in the past; breeding has not been confirmed more than last 10 years.

Conservation Status – IUCN Red List Categories (first symbol)/ Georgia red List Categories (second symbol):

- **CR = Critically Endangered**
- **EN = Endangered**
- **VU = Vulnerable**
- **NT = Near Threatened**
- **LC = Least Concern**

A. NON-PASSERINES – 37 species

Order I. Birds of Prey (*Falconiformes*) – 21 species

Family I / 1. Buzzards, etc (*Accipitridae*) - 17 species

1. Black Kite (*Milvus migrans*) **Status of presence PM** / **Conservation Status: LC**
2. Short-toed Snake-eagle (*Circaetus gallicus*) **Status of presence PM** / **Conservation Status: LC**
3. Eurasian Sparrowhawk (*Accipiter nisus*) **Status of presence SV, PM, WV** / **Conservation Status: LC**
4. Northern Goshawk (*Accipiter gentilis*) **Status of presence PM, WV** / **Conservation Status: LC**
5. Levant Sparrowhawk (*Accipiter brevipes*) **Status of presence PM** / **Conservation Status: LC VU**
6. Common Buzzard (*Buteo buteo*) **Status of presence PM, YR-V, WV** / **Conservation Status: LC**
7. Long-legged Buzzard (*Buteo rufinus*) **Status of presence PM YR-V LC / Conservation Status: VU**
8. Rough-legged Buzzard (*Buteo lagopus*)

Status of presence PM, WV / **Conservation Status: LC**

9. European Honey-buzzard (*Pernis apivorus*)
   Status of presence PM / **Conservation Status: LC**
10. Booted Eagle (*Hieraaetus pennatus*)
    Status of presence PM / **Conservation Status: LC**
11. Lesser Spotted Eagle (*Aquila pomarina*)
    Status of presence PM / **Conservation Status: LC**
12. Imperial Eagle (*Aquila heliaca*)
    Status of presence OV / **Conservation Status: VU**
13. Western Marsh Harrier (*Circus aeruginosus*)
    Status of presence PM / **Conservation Status: LC**
14. Northern Harrier (*Circus cyaneus*)
    Status of presence PM, WV / **Conservation Status: LC**
15. Montagu's Harrier (*Circus pygargus*)
    Status of presence PM / **Conservation Status: LC**
16. Pallid Harrier (*Circus macrourus*)
    Status of presence PM / Conservation Status: NT
17. Hen Harrier (*Circus pygargus*)
    Status of presence PM, WV / **Conservation Status: LC**

Family I / 2. Falcons (*Falconidae*) - 4 species

18. Merlin (*Falco columbarius*)
    Status of presence PM, WV / **Conservation Status: LC**
19. Eurasian Hobby (*Falco subbuteo*)
    Status of presence PM / **Conservation Status: LC**
20. Lesser Kestrel (*Falco naumanni*)
    Status of presence FB, PM / Conservation Status: LC CR
21. Common Kestrel (*Falco tinnunculus*)
    Status of presence PM, SV / **Conservation Status: LC**

Order II. *GALLIFORMES* – 1 species

Family II / 1. Pheasants, Quails – 1 species

22. Common Quail (*Coturnix coturnix*)
    Status of presence PM, SB/ Conservation Status: LC

ORDER III. *COLUMBIFORMES* - 4 species

Family III / 1. Pigeons and Doves (*Columbidae*) - 4 species

23. Feral Pigeon (*Columba livia f. domesticus*)
    Status of presence YR-V / Conservation Status: LC
24. Common Wood Pigeon (*Columba palumbus*)
    Status of presence PM / Conservation Status: LC
25. European Turtle-dove (*Streptopelia turtur*)
    Status of presence PM / Conservation Status: LC
26. Eurasian collared dove (Streptopelia decaocto)
    Status of presence YR-R or partial migrant / Conservation Status: LC

ORDER IV. *CUCULIFORMES* - 1 species

Family IV / 1. Cuckoos (*Cuculidae*) - 1 species

27. Common Cuckoo (*Cuculus canorus*)
    Status of presence SB, PM/ Conservation Status: LC

ORDER V. *STRIGIFORMES* - 3 species

Family V / 1. Owls (*Strigidae*) - 3 species

28. Northern Long-eared Owl (*Asio otus*)
    Status of presence ND, (YR-V? or YR-R) / Conservation Status: LC
29. Eurasian Scops-owl (*Otus scops*)
    Status of presence SB, PM / Conservation Status: LC
30. Little Owl (*Athene noctua*)
    Status of presence YR-R / Conservation Status: LC

ORDER VI. *CAPRIMULGIFORMES*- 1 species

Family VI - 1. Nightjars (*Caprimulgidae*)

31. Eurasian Nightjar (*Caprimulgus europaeus*)
    Status of presence SB, PM / Conservation Status: LC

ORDER VII. *APODIFORMES* - 1 species

Family VII / 1. Swifts (*Apodidae*) - 1 species

32. Common Swift (*Apus apus*)
    Status of presence SV, PM / Conservation Status: LC

ORDER VIII. *CORACIIFORMES* - 3 species

Family VIII / 1. Bee-eaters (*Meropidae*) - 1 species

33. European Bee-eater (*Merops apiaster*)
    Status of presence SV, PM / Conservation Status: LC

Family VIII / 2. Rollers (*Coraciidae*) - 1 species

34. European Roller (*Coracias garrulous*)
    Status of presence SV, PM / Conservation Status: LC

Family VIII / 3. Hoopoes (*Upupidae*) - 1 species

35. Eurasian Hoopoe (*Upupa epops*)
    Status of presence SB, PM / Conservation Status: LC

ORDER IX. *PICIFORMES* - 2 species

Family IX / 1. Woodpeckers (*Picidae*) - 2 species

36. Great Spotted Woodpecker (*Dendrocopos major*)
    Status of presence YR-R / Conservation Status: LC
37. Lesser Spotted Woodpecker (*Dendrocopos minor*)
    Status of presence YR-R / Conservation Status: LC

B. PASSERINES

Order X. PASSERINES (*PASSERIFORMES*) – 59 species

Family X / 1. Larks (*Alaudidae*) - 6 species

38. Lesser Short-toed Lark (*Calandrella* rufescens)
    Status of presence SB, PM / Conservation Status: LC
39. Calandra Lark (*Melanocorypha calandra*)
    Status of presence SB, PM / Conservation Status: LC
40. Greater Short-toed Lark (*Calandrella brachydactyla*)
    Status of presence SB, PM / Conservation Status: LC
41. Woodlark (*Lullula arborea*)
    Status of presence SB, PM / Conservation Status: LC
42. Eurasian Skylark (*Alauda arvensis*)
    Status of presence SB, PM / Conservation Status: LC
43. Crested Lark (*Galerida cristata*)
    Status of presence SB, PM / Conservation Status: LC

Family X / 2. Swallows and Martins (*Hirundinidae*) - 2 species

44. Barn Swallow (*Hirundo rustica*)
    Status of presence SB, SV, PM / Conservation Status: LC
45. Northern House Martin (*Delichon urbica*)
    Status of presence SV, SB, PM/ Conservation Status: LC

Family X / 3. Wagtails and Pipits (*Motacillidae*) - 7 species

46. Tree Pipit (*Anthus trivialis*)
    Status of presence SB, PM / Conservation Status: LC
47. Tawny Pipit (*Anthus campestris*)
    Status of presence SB, PM / Conservation Status: LC
48. Water Pipit (*Anthus spinoletta*)
    Status of presence PM, WV / Conservation Status: LC
49. Meadow Pipit (*Anthus pratensis*)
    Status of presence PM / Conservation Status: LC
50. Red-throated Pipit (*Anthus cervinus*)
    Status of presence PM / Conservation Status: LC
51. Pied, or White, Wagtail (*Motacilla alba*)
    Status of presence YR-V, SB, PM / Conservation Status: LC
52. Yellow Wagtail (*Motacilla flava*) (*Motacilla cinerea*)
    Status of presence SV (SB?) PM / Conservation Status: LC

Family X / 4.Shrikes (*Laniidae*) – 3 species

53. Lesser Grey Shrike (*Lanius minor*)
    Status of presence SB, PM / Conservation Status: LC
54. Woodchat Shrike (*Lanius senator*)
    Status of presence SB?, PM / Conservation Status: LC
55. Red-backed Shrike (*Lanius collurio*)
    Status of presence SB, PM / Conservation Status: LC

Family X / 5.Warblers (*Sylvidae*) - 4 species

56. Common Whitethroat (*Sylvia communis*)
    Status of presence SB, PM / Conservation Status: LC
57. Blackcap (*Sylvia atricapilla*)
    Status of presence SB, PM / Conservation Status: LC
58. Common Chiffchaff (*Phylloscopus collybita*)
    Status of presence SB, PM / Conservation Status: LC
59. Greenish Warbler (*Phylloscopus trochiloides*)
    Status of presence PM / Conservation Status: LC

Family X / 6.*Muscicapidae* – 10 species

60. Spotted Flycatcher (*Muscicapa striata*)
    Status of presence SB, PM / Conservation Status: LC

61. Common Stonechat (*Saxicola torquata*)
    Status of presence SB, PM / Conservation Status: LC
62. Whinchat (*Saxicola rubetra*)
    Status of presence SB, PM / Conservation Status: LC
63. Northern Wheatear (*Oenanthe oenanthe*)
    Status of presence PM / Conservation Status: LC
64. Isabelline Wheatear (*Oenanthe isabellina*)
    Status of presence SB, PM / Conservation Status: LC
65. Black-eared Wheatear (*Oenanthe hispanica*)
    Status of presence SB, PM / Conservation Status: LC
66. Pied Wheatear (*Oenanthe pleschanka*)
    Status of presence SB, PM / Conservation Status: LC
67. Common Redstart (*Phoenicurus phoenicurus*)
    Status of presence SB, PM / Conservation Status: LC
68. Semi-collared Flycatcher (*Ficedula semitorquata*)
    Status of presence PM / Conservation Status: LC
69. European Robin (*Erithacus rubecula*)
    Status of presence YR-R / Conservation Status: LC

Family X / 7. Thrushes (*Turdidae*) - 4 species

70. Common Blackbird (*Turdus merula*)
    Status of presence YR-R / Conservation Status: LC
71. Song Thrush (*Turdus philomelos*)
    Status of presence SB?, PM / Conservation Status: LC
72. Mistle Thrush (*Turdus viscivorus*)
    Status of presence SB?, PM, WV / Conservation Status: LC
73. Fieldfare (*Turdus pilaris*)
    Status of presence PM, WV / Conservation Status: LC

Family X / 8. Long-tailed Tits (*Aegithalidae*) - 1 species

74. Long-tailed Tit (*Aegithalos caudatus*)
    Status of presence YR-R / Conservation Status: LC

Family X / 9. Tits (*Paridae*) -2 species

75. Great Tit (*Parus major*)
    Status of presence YR-R / Conservation Status: LC
76. Blue Tit (*Parus caeruleus*)
    Status of presence YR-R / Conservation Status: LC

Family X / 10. Wrens (*Troglodytidae*) - 1 species

77. Winter Wren (*Troglodytes troglodytes*)
    Status of presence YR-R / Conservation Status: LC

Family X / 11. Sparrows (*Passeridae*) - 3 species

78. Tree Sparrow (*Passer montanus*)
    Status of presence YR-R / Conservation Status: LC
79. House Sparrow (*Passer domesticus*)
    Status of presence YR-R / Conservation Status: LC
80. Rock Sparrow (*Petronia petronia*)
    Status of presence YR-R / Conservation Status: LC

Family X / 12. Orioles (*Oriolidae*) - 1 species

81. Eurasian Golden Oriole (*Oriolus oriolus*)
    Status of presence PM/ Conservation Status: LC

Family X / 13. Starlings (*Sturnidae*) - 1 species

82. Common Starling (*Sturnus vulgaris*)
    Status of presence YR-V, SB, PM, WV / Conservation Status: LC

Family X / 14. Crows (*Corvidae*) - 5 species

83. Eurasian Jay (*Garrulus glandarius*)
    Status of presence YR-R / Conservation Status: LC
84. Magpie (*Pica pica*)
    Status of presence YR-R / Conservation Status: LC
85. Rook (*Corvus frugilegus*)
    Status of presence PM, WV / Conservation Status: LC
86. Hooded Crow (*Corvus cornix*)
    Status of presence YR-R / Conservation Status: LC
87. Common Raven (*Corvus corax*)
    Status of presence YR-R / Conservation Status: LC

Family X / 15. Finches (*Fringillidae*) - 5 species

88. Common Chaffinch (*Fringilla coelebs*)
    Status of presence YR-R/ Conservation Status: LC

89. Brambling (*Fringilla montifringilla*) **Status of presence PM, WV/ Conservation Status: LC**
90. European Goldfinch (*Carduelis carduelis*) **Status of presence YR-R, PM, WV/ Conservation Status: LC**
91. European Greenfinch (*Carduelis chloris*) **Status of presence YR-R / Conservation Status: LC**
92. Common Linnet (*Carduelis cannabina*) **Status of presence SB, PM / Conservation Status: LC**

Family X / 16. Buntings (*Emberizidae*) - 4 species

93. Corn Bunting (*Miliaria calandra*) **Status of presence SB, PM/ Conservation Status: LC**
94. Yellowhammer (*Emberiza citrinella*) **Status of presence PM / Conservation Status: LC**
95. Black-headed Bunting (*Emberiza melanocephala*) **Status of presence SB, PM/ Conservation Status: LC**
96. Ortolan Bunting (*Emberiza hortulana*) **Status of presence SB, PM/ Conservation Status: LC**

► Number of recorded bird species by seasons

Below is information on the number of bird species in different seasons of the year, recorded during the period of field work carried out within the limits of Project Area in 2021 – 2022:

Autumn 2021

In total, during the field works, carried out during nine calendar/working days from October 6 to October 26, 2021, at least 60 bird species have been recorded within the limits of Ruisi WPP Project Area and in adjacent areas, 18 – Non-Passerine bird species and 42 – Passerines. These birds are associated in seven systematic orders. List of the bird species recorded in autumn 2021 is presented below:

1. Black Kite (*Milvus migrans*)
2. Short-toed Snake-eagle (*Circaetus gallicus*)
3. Eurasian Sparrowhawk (*Accipiter nisus*)
4. Northern Goshawk (*Accipiter gentilis*)
5. Common Buzzard (*Buteo buteo*)
6. Long-legged Buzzard (*Buteo rufinus*)
7. Rough-legged Buzzard (*Buteo lagopus*)
8. Western Marsh Harrier (*Circus aeruginosus*)
9. Northern Harrier (*Circus cyaneus*)
10. Montagu's Harrier (*Circus pygargus*)
11. Common Kestrel (*Falco tinnunculus*)
12. Feral Pigeon (*Columba livia f. domesticus*)
13. Little Owl (*Athene noctua*)
14. Eurasian Nightjar (*Caprimulgus europaeus*)
15. European Bee-eater (*Merops apiaster*)
16. European Roller (*Coracias garrulus*)
17. Eurasian Hoopoe (*Upupa epops*)
18. Lesser Spotted Woodpecker (*Dendrocopos minor*)
19. Great Spotted Woodpecker (*Dendrocopos major*)
20. Lesser Short-toed Lark (*Calandrella rufescens*)
21. Calandra Lark (*Melanocorypha calandra*)
22. Greater Short-toed Lark (*Calandrella brachydactyla*)
23. Woodlark (*Lullula arborea*)
24. Eurasian Skylark (*Alauda arvensis*)
25. Crested Lark (*Galerida cristata*)
26. Barn Swallow (*Hirundo rustica*)
27. Northern House Martin (*Delichon urbica*)
28. Tree Pipit (*Anthus trivialis*)
29. Tawny Pipit (*Anthus campestris*)
30. Pied, or White, Wagtail (*Motacilla alba*)
31. Yellow Wagtail (*Motacilla flava*)
32. Common Whitethroat (*Sylvia communis*)
33. Blackcap (*Sylvia atricapilla*)
34. Common Chiffchaff (*Phylloscopus collybita*)
35. Spotted Flycatcher (*Muscicapa striata*)
36. Common Stonechat (*Saxicola torquata*)
37. Whinchat (*Saxicola rubetra*)
38. Northern Wheatear (*Oenanthe oenanthe*)
39. Isabelline Wheatear (*Oenanthe isabellina*)

40. Black-eared Wheatear (*Oenanthe hispanica*)
41. Common Redstart (*Phoenicurus phoenicurus*)
42. European Robin (*Erithacus rubecula*)
43. Common Blackbird (*Turdus merula*)
44. Mistle Thrush (*Turdus viscivorus*)
45. Long-tailed Tit (*Aegithalos caudatus*)
46. Great Tit (*Parus major*)
47. Blue Tit (*Parus caeruleus*)
48. Winter Wren (*Troglodytes troglodytes*)
49. Tree Sparrow (*Passer montanus*)
50. House Sparrow (*Passer domesticus*)
51. Common Starling (*Sturnus vulgaris*)
52. Eurasian Jay (*Garrulus glandarius*)
53. Magpie (*Pica pica*)
54. Rook (*Corvus frugilegus*)
55. Hooded Crow (*Corvus cornix*)
56. Common Raven (*Corvus corax*)
57. Common Chaffinch (*Fringilla coelebs*)
58. European Greenfinch (*Carduelis chloris*)
59. European Goldfinch (*Carduelis carduelis*)
60. Black-headed Bunting (*Emberiza melanocephala*)
61. Corn Bunting (*Miliaria calandra*)

Winter 2022

As might be expected, the Avifauna of wintering birds at the territory under consideration turned out to be extremely poor both in qualitative and quantitative terms. In total, during 8 calendar/working days between January 20, 2022 and February 14, 2022, only 35 bird species were recorded within the limits of the Ruisi WPP Project Area and in adjacent areas. Among these 35 species, 12 species were non-passerines and other 23 bird species were passerines. These 35 bird species are associated in five systematic orders. List of the bird species recorded in winter 2022 presented below:

1. Hen Harrier (*Circus pygargus*)
2. Goshawk (*Accipiter gentilis*)
3. Eurasian Sparrowhawk (*Accipiter nisus*)
4. Common Buzzard (*Buteo buteo*)
5. Long-legged Buzzard (*Buteo rufinus*)
6. Rough-legged Buzzard (*Buteo lagopus*)
7. Common Kestrel (*Falco tinnunculus*)
8. Merlin (*Falco columbarius*)
9. Feral Pigeon - *Columba livia f. domesticus*
10. Long-eared Owl (*Asio otus*)
11. Little Owl (*Athene noctua*)
12. Great Spotted Woodpecker (*Dendrocopos major*)
13. Calandra Lark (*Melanocorypha calandra*)
14. Crested Lark (*Galerida cristata*)
15. Water Pipit (*Anthus spinoletta*)
16. White (Pied) Wagtail (*Motacilla alba*)
17. European Robin (*Erithacus rubecula*)
18. Common Blackbird (*Turdus merula*)
19. Fieldfare (*Turdus pilaris*)
20. Long-tailed Tit (*Aegithalos caudatus*)
21. Blue Tit (*Parus caeruleus*)
22. Great Tit (*Parus major*)
23. Winter Wren (*Troglodytes troglodytes*)
24. Eurasian Jay (*Garrulus glandarius*)
25. Magpie (*Pica pica*)
26. Rook (*Corvus frugilegus*)
27. Hooded Crow (*Corvus cornix*)
28. Common Raven (*Corvus corax*)
29. Common Starling (*Sturnus vulgaris*)
30. House Sparrow (*Passer domesticus*)
31. Tree Sparrow (*Passer montanus*)
32. Common Chaffinch (*Fringilla coelebs*)
33. Brambling (*Fringilla montifringilla*)
34. European Goldfinch (*Carduelis carduelis*)
35. European Greenfinch (*Carduelis chloris*)

Spring 2022

In total, during 21 calendar / working days between January April 1, 2022 and May 26, 2022, 80 bird species were recorded within the limits of the Ruisi WPP Project Area and in adjacent areas. Among these 80 species, 31 species were non-passerines and other 51 bird species were passerines. These 80 bird species are associated in 14 systematic orders. List of the bird species recorded in spring 2022 presented below:

1. Black Kite (*Milvus migrans*)
2. Short-toed Snake-eagle (*Circaetus gallicus*)
3. Eurasian Sparrowhawk (*Accipiter nisus*)
4. Northern Goshawk (*Accipiter gentilis*)
5. Levant Sparrowhawk (*Accipiter brevipes*)

6. Common Buzzard (*Buteo buteo*)
7. Long-legged Buzzard (*Buteo rufinus*)
8. European Honey-buzzard (*Pernis apivorus*)
9. Booted Eagle (*Hieraaetus pennatus*)
10. Lesser Spotted Eagle (*Aquila pomarina*)
11. Western Marsh Harrier (*Circus aeruginosus*)
12. Northern Harrier (*Circus cyaneus*)
13. Montagu's Harrier (*Circus pygargus*)
14. Pallid Harrier (*Circus macrourus*)
15. Eurasian Hobby (*Falco subbuteo*)
16. Lesser Kestrel (*Falco naumanni*)
17. Common Kestrel (*Falco tinnunculus*)
18. Common Quail (*Coturnix coturnix*)
19. Feral Pigeon (*Columba livia f. domesticus*)
20. Common Wood Pigeon (*Columba palumbus*)
21. European Turtle-dove (*Streptopelia turtur*)
22. Common Cuckoo (*Cuculus canorus*)
23. Northern Long-eared Owl (*Asio otus*)
24. Eurasian Scops-owl (*Otus scops*)
25. Little Owl (*Athene noctua*)
26. Eurasian Nightjar (*Caprimulgus europaeus*)
27. Common Swift (*Apus apus*)
28. European Bee-eater (*Merops apiaster*)
29. European Roller (*Coracias garrulous*)
30. Eurasian Hoopoe (*Upupa epops*)
31. Great Spotted Woodpecker (*Dendrocopos major*)
32. Lesser Short-toed Lark (*Calandrella rufescens*)
33. Calandra Lark (*Melanocorypha calandra*)
34. Greater Short-toed Lark (*Calandrella brachydactyla*)
35. Woodlark (*Lullula arborea*)
36. Eurasian Skylark (*Alauda arvensis*)
37. Crested Lark (*Galerida cristata*)
38. Barn Swallow (*Hirundo rustica*)
39. Northern House Martin (*Delichon urbica*)
40. Tree Pipit (*Anthus trivialis*)
41. Tawny Pipit (*Anthus campestris*)
42. Pied, or White, Wagtail (*Motacilla alba*)
43. Yellow Wagtail (*Motacilla flava*) (*Motacilla cinerea*)
44. Lesser Grey Shrike (*Lanius minor*)
45. Woodchat Shrike (*Lanius senator*)
46. Red-backed Shrike (*Lanius collurio*)
47. Common Whitethroat (*Sylvia communis*)
48. Blackcap (*Sylvia atricapilla*)
49. Common Chiffchaff (*Phylloscopus collybita*)
50. Greenish Warbler (*Phylloscopus trochiloides*)
51. Spotted Flycatcher (*Muscicapa striata*)
52. Common Stonechat (*Saxicola torquata*)
53. Whinchat (*Saxicola rubetra*)
54. Northern Wheatear (*Oenanthe oenanthe*)
55. Isabelline Wheatear (*Oenanthe isabellina*)
56. Black-eared Wheatear (*Oenanthe hispanica*)
57. Common Redstart (*Phoenicurus phoenicurus*)
58. European Robin (*Erithacus rubecula*)
59. Common Blackbird (*Turdus merula*)
60. Song Thrush (*Turdus philomelos*)
61. Mistle Thrush (*Turdus viscivorus*)
62. Long-tailed Tit (*Aegithalos caudatus*)
63. Great Tit (*Parus major*)
64. Blue Tit (*Parus caeruleus*)
65. Winter Wren (*Troglodytes troglodytes*)
66. Tree Sparrow (*Passer montanus*)
67. House Sparrow (*Passer domesticus*)
68. Eurasian Golden Oriole (*Oriolus oriolus*)
69. Common Starling (*Sturnus vulgaris*)
70. Eurasian Jay (*Garrulus glandarius*)
71. Magpie (*Pica pica*)
72. Hooded Crow (*Corvus cornix*)
73. Common Raven (*Corvus corax*)
74. Common Chaffinch (*Fringilla coelebs*)
75. European Goldfinch (*Carduelis carduelis*)
76. European Greenfinch (*Carduelis chloris*)
77. Corn Bunting (*Miliaria calandra*)
78. Yellowhammer (*Emberiza citrinella*)
79. Black-headed Bunting (*Emberiza melanocephala*)
80. Ortolan Bunting (*Emberiza hortulana*)

Summer 2022

In total, during 21 calendar/working days between June 5, 2022 and July 15, 2022, at least 64 bird species were recorded within the limits of the Ruisi WPP Project Area and in adjacent areas. Among these 64 species, 20 species were non-passerines and other 44 bird species were passerines. These

64 bird species are associated in the ten systematic orders. List of the bird species recorded in summer 2022 is presented below:

1. Short-toed Snake-eagle (*Circaetus gallicus*)
2. Eurasian Sparrowhawk (*Accipiter nisus*)
3. Common Buzzard (*Buteo buteo*)
4. Long-legged Buzzard (*Buteo rufinus*)
5. Western Marsh Harrier (*Circus aeruginosus*)
6. Montagu's Harrier (*Circus pygargus*)
7. Common Kestrel (*Falco tinnunculus*)
8. Common Quail (*Coturnix coturnix*)
9. Feral Pigeon (*Columba livia f. domesticus*)
10. Common Wood Pigeon (*Columba palumbus*)
11. European Turtle-dove (*Streptopelia turtur*)
12. Common Cuckoo (*Cuculus canorus*)
13. Eurasian Scops-owl (*Otus scops*)
14. Little Owl (*Athene noctua*)
15. Eurasian Nightjar (*Caprimulgus europaeus*)
16. Common Swift (*Apus apus*)
17. European Bee-eater (*Merops apiaster*)
18. European Roller (*Coracias garrulous*)
19. Eurasian Hoopoe (*Upupa epops*)
20. Great Spotted Woodpecker (*Dendrocopos major*)
21. Lesser Short-toed Lark (*Calandrella rufescens*)
22. Calandra Lark (*Melanocorypha calandra*)
23. Greater Short-toed Lark (*Calandrella brachydactyla*)
24. Woodlark (*Lullula arborea*)
25. Eurasian Skylark (*Alauda arvensis*)
26. Barn Swallow (*Hirundo rustica*)
27. Northern House Martin (*Delichon urbica*)
28. Tree Pipit (*Anthus trivialis*)
29. Tawny Pipit (*Anthus campestris*)
30. Pied, or White, Wagtail (*Motacilla alba*)
31. Yellow Wagtail (*Motacilla flava*) (*Motacilla cinerea*)
32. Lesser Grey Shrike (*Lanius minor*)
33. Red-backed Shrike (*Lanius collurio*)
34. Common Whitethroat (*Sylvia communis*)
35. Blackcap (*Sylvia atricapilla*)
36. Common Chiffchaff (*Phylloscopus collybita*)
37. Greenish Warbler (*Phylloscopus trochiloides*)
38. Spotted Flycatcher (*Muscicapa striata*)
39. Common Stonechat (*Saxicola torquata*)
40. Whinchat (*Saxicola rubetra*)
41. Northern Wheatear (*Oenanthe oenanthe*)
42. Isabelline Wheatear (*Oenanthe isabellina*)
43. Common Redstart (*Phoenicurus phoenicurus*)
44. European Robin (*Erithacus rubecula*)
45. Common Blackbird (*Turdus merula*)
46. Song Thrush (*Turdus philomelos*)
47. Mistle Thrush (*Turdus viscivorus*)
48. Long-tailed Tit (*Aegithalos caudatus*)
49. Great Tit (*Parus major*)
50. Blue Tit (*Parus caeruleus*)
51. Winter Wren (*Troglodytes troglodytes*)
52. Tree Sparrow (*Passer montanus*)
53. House Sparrow (*Passer domesticus*)
54. Common Starling (*Sturnus vulgaris*)
55. Eurasian Jay (*Garrulus glandarius*)
56. Magpie (*Pica pica*)
57. Hooded Crow (*Corvus cornix*)
58. Common Raven (*Corvus corax*)
59. Common Chaffinch (*Fringilla coelebs*)
60. European Goldfinch (*Carduelis carduelis*)
61. European Greenfinch (*Carduelis chloris*)
62. Corn Bunting (*Miliaria calandra*)
63. Black-headed Bunting (*Emberiza melanocephala*)
64. Ortolan Bunting (*Emberizahortulana*)

Autumn 2022

In total, during 12 calendar/working days between September 11 and September 27, 2022, at least 74 bird species were recorded within the limits of the Ruisi WPP Project Area and in adjacent areas. Among these 77 species, 32 species were non-passerines and other 45 bird species were passerines. These 77 bird species are associated in 14 ten systematic orders. The list of the bird species recorded during fieldwork in autumn 2022 is presented below:

1. Black Kite (*Milvus migrans*)

2. Short-toed Snake-eagle (*Circaetus gallicus*)
3. Eurasian Sparrowhawk (*Accipiter nisus*)
4. Northern Goshawk (*Accipiter gentilis*)
5. Levant Sparrowhawk (*Accipiter brevipes*)
6. Common Buzzard (*Buteo buteo*)
7. Long-legged Buzzard (*Buteo rufinus*)
8. European Honey-buzzard (*Pernis apivorus*)
9. Booted Eagle (*Hieraaetus pennatus*)
10. Lesser Spotted Eagle (*Aquila pomarina*)
11. Western Marsh Harrier (*Circus aeruginosus*)
12. Northern, or Hen, Harrier (*Circus cyaneus*)
13. Montagu's Harrier (*Circus pygargus*)
14. Pallid Harrier (*Circus macrourus*)
15. Eurasian Hobby (*Falco subbuteo*)
16. Common Kestrel (*Falco tinnunculus*)
17. Common Quail (*Coturnix coturnix*)
18. Feral Pigeon (*Columba livia f. domesticus*)
19. Common Wood Pigeon (*Columba palumbus*)
20. European Turtle-dove (*Streptopelia turtur*)
21. Eurasian collared dove (*Streptopelia decaocto*)
22. Common Cuckoo (*Cuculus canorus*)
23. Northern Long-eared Owl (*Asio otus*)
24. Eurasian Scops-owl (*Otus scops*)
25. Little Owl (*Athene noctua*)
26. Eurasian Nightjar (*Caprimulgus europaeus*)
27. Common Swift (*Apus apus*)
28. European Bee-eater (*Merops apiaster*)
29. European Roller (*Coracias garrulous*)
30. Eurasian Hoopoe (*Upupa epops*)
31. Great Spotted Woodpecker (*Dendrocopos major*)
32. Lesser Spotted Woodpecker (*Dendrocopos minor*)
33. Lesser Short-toed Lark (*Calandrella rufescens*)
34. Calandra Lark (*Melanocorypha calandra*)
35. Greater Short-toed Lark (*Calandrella brachydactyla*)
36. Woodlark (*Lullula arborea*)
37. Eurasian Skylark (*Alauda arvensis*)
38. Crested Lark (*Galerida cristata*)
39. Barn Swallow (*Hirundo rustica*)
40. Northern House Martin (*Delichon urbica*)
41. Tree Pipit (*Anthus trivialis*)
42. Tawny Pipit (*Anthus campestris*)
43. Pied, or White, Wagtail (*Motacilla alba*)
44. Yellow Wagtail (*Motacilla flava*) (*Motacilla cinerea*)
45. Lesser Grey Shrike (*Lanius minor*)
46. Common Whitethroat (*Sylvia communis*)
47. Common Chiffchaff (*Phylloscopus collybita*)
48. Spotted Flycatcher (*Muscicapa striata*)
49. Common Stonechat (*Saxicola torquata*)
50. Whinchat (*Saxicola rubetra*)
51. Northern Wheatear (*Oenanthe oenanthe*)
52. Isabelline Wheatear (*Oenanthe isabellina*)
53. Black-eared Wheatear (*Oenanthe hispanica*)
54. Pied Wheatear (*Oenanthe pleschanka*)
55. Common Redstart (*Phoenicurus phoenicurus*)
56. European Robin (*Erithacus rubecula*)
57. Common Blackbird (*Turdus merula*)
58. Mistle Thrush (*Turdus viscivorus*)
59. Long-tailed Tit (*Aegithalos caudatus*)
60. Great Tit (*Parus major*)
61. Blue Tit (*Parus caeruleus*)
62. Winter Wren (*Troglodytes troglodytes*)
63. Tree Sparrow (*Passer montanus*)
64. House Sparrow (*Passer domesticus*)
65. Rock Sparrow (*Petronia petronia*)
66. Common Starling (*Sturnus vulgaris*)
67. Eurasian Jay (*Garrulus glandarius*)
68. Magpie (*Pica pica*)
69. Hooded Crow (*Corvus cornix*)
70. Common Raven (*Corvus corax*)
71. Common Chaffinch (*Fringilla coelebs*)
72. European Goldfinch (*Carduelis carduelis*)
73. European Greenfinch (*Carduelis chloris*)
74. Common Linnet (*Carduelis cannabina*)
75. Corn Bunting (*Milaria calandra*)
76. Black-headed Bunting (*Emberiza melanocephala*)
77. Ortolan Bunting (*Emberiza hortulana*)

December 27, 2021
REPORT
TO JSC Wind Power

REPORT

ON THE ORNITHOLOGICAL MONITORING CARRIED OUT AT THE 206 MW Ruisi WIND POWER PLANT PROJECT AREA IN AUTUMN 2021

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PART 1. PREFACE

The main aim of the ornithological survey conducted in autumn 2021 was analysis of the ornithological situation within the limits of the 206 MW Ruisi Wind Power Plant Project Area during the autumn transit migrations of birds, identification of the species composition of passage visitors, their status, periods and duration of presence, numbers and densities, habitat selection and territorial distribution within the various sections of Project area as well as in adjacent areas.

Priority in observations in autumn 2021 was given to the target bird species, or diurnal Birds of Prey (Falconiformes) and Owls (Strigiformes). Naturally, to these bird species given most of our attention in collection of the materials. Besides that, specific attention has been paid to the collecting of data in the most sensitive areas and on the threatened bird species, which are included in the IUCN Red List, List of the Globally Threatened Birds in Europe and the Red list of Georgia, 2006.

PART 2. MATERIAL AND METHODS

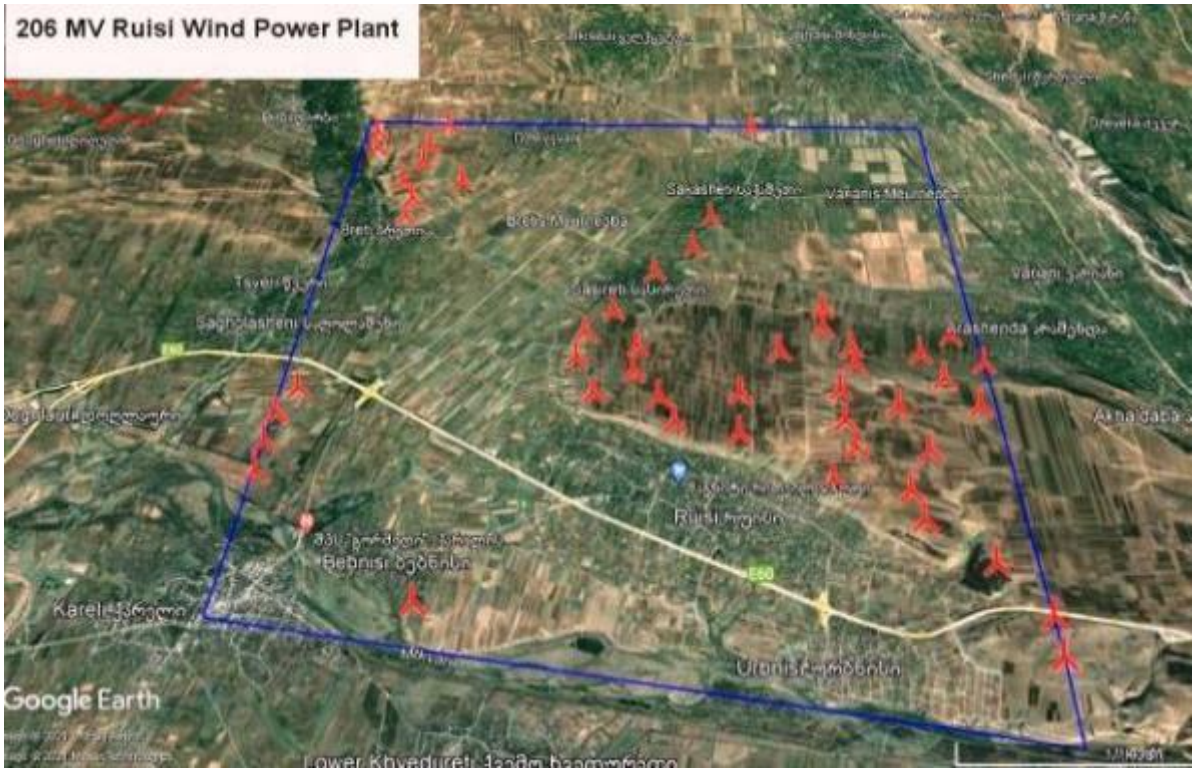
The presented report compiled by Dr. Alexander Abuladze.

Factual data for this report were collected during field observations by two professional ornithologists - Dr. Alexander Abuladze from the Institute of Zoology, Ilia State University in assistance with Prof. Dr. Gia Edisherashvili from the Gori State University.

The ornithological data collecting within the limits of the 206 MW Ruisi Wind Power Plant Project Area (picture 1) as well as in adjacent areas, were undertaken during nine (eight) calendar/ working days from October 6 and October 26, 2021:

- October 6, 2021 – from 10:10 to 20:20 (10 hours and 10 minutes);
- October 9, 2021 – from 10:45 to 20:15 (9 hours and 30 minutes);
- October 11, 2021 – from 09:40 to 19:50 (10 hours and 10 minutes);
- October 15, 2021 – from 10:30 to 19:15 (8 hours and 45 minutes);
- October 18, 2021 – from 09:20 to 18:10 (8 hours and 50 minutes);
- October 20, 2021 – from 10:50 to 18:00 (7 hours and 10 minutes);
- October 22, 2021 - from 14:15 to 20:00 (5 hours and 45 minutes);

- October 24, 2021 – from 08:00 to 19:50 (11 hours and 50 minutes);
- October 26, 2021 – from 12:55 to 19:45 (6 hours and 50 minutes);



Picture 1. Study area - 206 MW Ruisi Wind Power Plant

All sections of the Ruisi WPP Project Area, especially areas and key-sites, sensitive and important from the ornithological diversity and conservation points of view, were preliminary selected for more detailed investigations during field works and all these areas and separate sites were visited during field works in autumn 2021. Data collected in each parts of Project Area during at least three working days and all, important for birds, preliminary selected areas and separate sites, were surveyed the course of study.

The main methods used during field works were a combinations of direct visual observations from vantage, or watching, point with a series of bird counts undertaken on foot along the preliminary selected counting routs (transects) crossed all the most important sections of study area with stops for visual observations from high points of relief.

Additionally, a series of visual observations made during regular road-car surveys, which carried out in the morning and in the evening hours. In order to study the spatial distribution, habitat selection of the target bird species and local daily movements in the study area, observations carried out also in the adjacent areas. Main methods of observation in adjacent areas were road-car survey with numerous stops from 5 to 30 minutes in the most interesting and important sites and visual observations from high points of relief. Ornithological surveys carried out throughout the daylight hours, commonly between 09:00 (+/- 60 minutes) and 19:00 (+/-60 minutes).

The description of the methods used during data collection in autumn 2021 in the area under consideration is detailed below.

2.1. Vantage Point Surveys, or direct visual observations from vantage point

Vantage point (VP) survey was undertaking in the following dates;

- October 6, 2021 – from 12:15 to 16:45 (4 hours and 30 minutes);
- October 9, 2021 – from 12:15 to 17:00 (4 hours and 45 minutes);
- October 11, 2021 – from 10:30 to 15:50 (5 hours and 20 minutes);
- October 15, 2021 – from 10:30 to 14:00 (3 hours and 30 minutes);
- October 18, 2021 – from 10:00 to 15:40 (5 hours and 40 minutes);
- October 20, 2021 – from 10:50 to 15:00 (4 hours and 10 minutes);

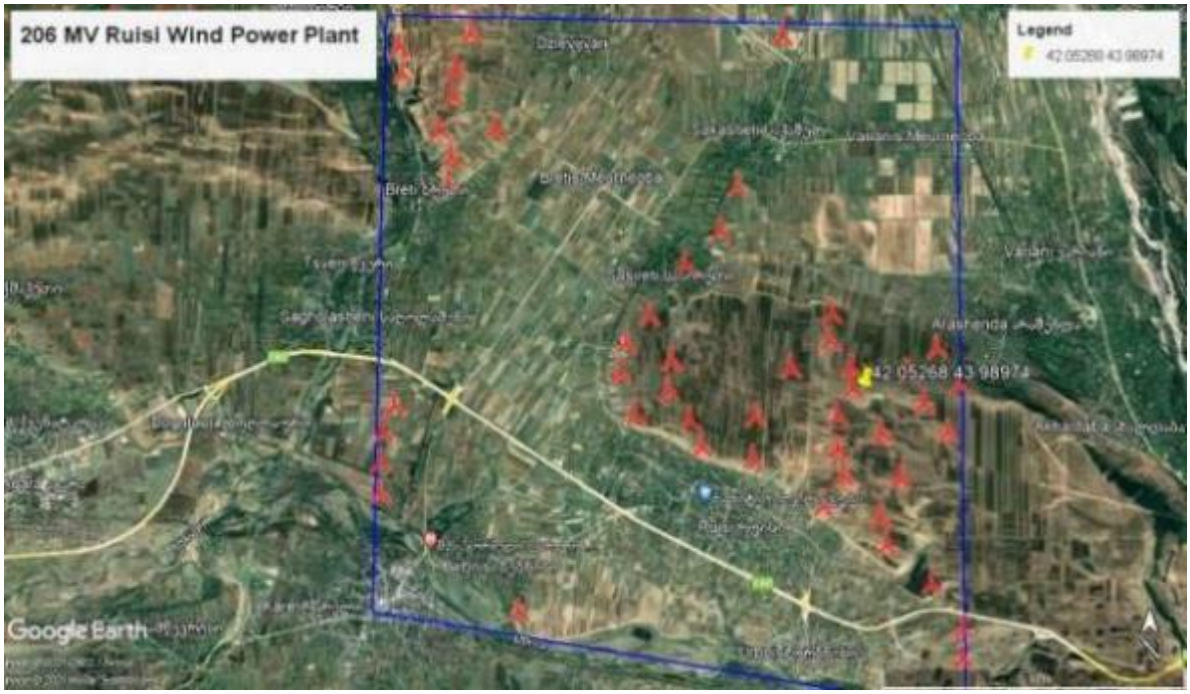
- October 22, 2021 - from 14:45 to 19:30 (4 hours and 45 minutes);
- October 24, 2021 – from 09:00 to 14:20 (5 hours and 20 minutes);
- October 26, 2021 – from 13:30 to 17:10 (4 hours and 40 minutes);

The total duration of vantage point surveys was about 42 hours and 50 minutes). The minimum duration of vantage point surveys was 3 hour and 30 minutes (on October 15, 2021) and the maximum was 5 hours and 40 minutes (on October 18, 2021).

Vantage point survey methodology follows that described in the international best practice “Scottish Natural Heritage, 2014. Guidance. Recommended bird survey methods to inform impact assessment of wind farms”.

Observations from the Vantage Point in late spring/summer carried out mainly during the hours when the activity of migratory birds and local summer breeders/non-breeding visitors is highest/ During the period of low activity of passage visitors, the counts were carried out mainly on foot along the preliminary selected routes.

The Vantage Point [**VP**] selected for direct visual observations during field works, conducted in May-July 2021, situated in south-eastern part of the monitored area.



Picture 2. Location of the Vantage Point during field works in autumn 2021

From the Vantage Point, a very good view of the all sections of project territory and all sides of the adjoining territories opened up. In good weather, visibility from the vantage point was up to the horizon, which allowed us to see flying birds from a distance of 4-5 km and more.

Taking into account relatively small area of Ruisi WPP Project Area and usage of powerful modern optical instruments (8x, 10x, 12x binoculars and telescopes), we could conclude that practically all parts of the Project Area were studied. Even areas with difficult reach, which were not passable (villages, ravines and woodlands in southwestern and southeastern corners of the area under consideration), were observed from highest points of terrain with the help of optical facilities.

Determination of the species belonging of migrating birds, passage visitors and year-round residents with local movements, their number, sex, flight directions and heights above the surface of the relief, behavioral features and other details of migration carried out on the territory that is indicated on the map (picture 2).

The Vantage Point surveys carried out usually by one surveyor together with one assistant, experienced in the identification of birds of Georgia.

2.2. Survey on foot

Survey on foot across all parts/sections of Ruisi WPP Project Area as well as in adjacent areas carried out by two surveyors – expert and assistant, in some cases together with assistant/driver (picture 3). Usually surveys on foot conducted throughout the daylight hours, usually in favourable weather conditions, optimal for visual observations.

The total duration of surveys on foot with stops for visual observations from high points of terrain was 30 hours and 30 minutes.

The minimum duration of surveys on foot was 45 minutes (on October 22, 2021) and the maximum was 4 hours and 55 minutes (on October 24, 2021).

The duration of surveys on foot during breeding season of birds for separate days was as follows:

- October 6, 2021 – from 16:45 to 20:20 (3 hours and 35 minutes);
- October 9, 2021 – from 11:25 to 12:15 (50 minutes) and from 17:00 to 20:15 (3 hours and 15 minutes), or 4 hours and 5 minutes in total;
- October 11, 2021 – from 09:55 to 10:30 (35 minutes) and from 15:50 to 19:10 (3 hours and 20 minutes), or 3 hours and 55 minutes in total;
- October 15, 2021 – from 14:00 to 18:50 (4 hours and 50 minutes);
- October 18, 2021 – from 09:35 to 10:00 (25 minutes) and from 15:40 to 17:45 (3 hours and 5 minutes), or 3 hours and 30 minutes in total;
- October 20, 2021 – from 15:00 to 17:15 (2 hours and 15 minutes);
- October 22, 2021 - from 14:15 to 14:45 (30 minutes) and from 19:30 to 19:45 (15 minutes), or 45 minutes in total;
- October 24, 2021 – from 08:20 to 09:00 (40 minutes) and from 14:20 to 19:15 (4 hours and 55 minutes);
- October 26, 2021 – from 12:55 to 13:30 (35 minutes) and from 17:10 to 19:15 (2 hours and 5 minutes), or 2 hours and 40 minutes;

Picture 3. October 9, 2021

2.3. Road-car surveys

Road-car surveys in open and semi-open habitats with field glasses from a moving car around and across 206 MW Ruisi Wind Power Plant Project Area as well as in adjacent areas. Road-car surveys, 7 hours and 10 minutes in total, carried out with a series of frequent short stops from 3 minutes to 5 minutes in high points with good conditions for visual observations. The minimum duration of road-car surveys was 15 minutes (on October 22, 2021) and the maximum was 2 hours and 5 minutes (on October 16, 2021).

Car "Nissan xTerra" used for road-car surveys (picture 4).

The duration of road-car surveys in autumn 2021 for separate days was as follows:

- October 6, 2021 – from 10:10 to 12:15 (2 hours and 5 minutes);
- October 9, 2021 – from 10:45 to 11:25 (40 minutes);
- October 11, 2021 – from 09:40 to 09:55 (15 minutes) and from 19:10 to 19:50 (40 minutes), or 55 minutes in total;
- October 15, 2021 – from 18:50 to 19:15 (25 minutes);
- October 18, 2021 – from 09:20 to 09:35 (15 minutes) and from 17:45 to 18:10 (25 minutes), or 40 minutes in total;
- October 20, 2021 – from 17:15 to 18:00 (45 minutes);
- October 22, 2021 - from 19:45 to 20:00 (15 minutes);
- October 24, 2021 – from 08:00 to 08:20 (20 minutes) and from 19:15 to 19:50 (35 minutes), or 55 minutes in total;
- October 26, 2021 – from 19:15 to 19:45 (30 minutes);

Picture 4. Car "Nissan xTerra" used for road-car surveys; October 6, 2021

2.4. Weather conditions

Usually bird counts were carried out in the more-or-less optimal for ornithological observations conditions, but in some days, especially on October 22, 2021, weather was extremely unfavorable for visual observations (cloudy 90 – 100%, heavy rainfalls, strong northern and northwestern winds, fog) for visual observations.

2.5. Used Equipment

Various binoculars, telescopes, photo cameras photo cameras, lenses and some other equipment used during field works in October 2021:

Identification of birds was through various binoculars “Nikon Aculon 10 x 50” and in some cases during road-car surveys through “Pentax 8 x 25” (picture 5). Besides that, binocular-cam “Trust 8 x 42” and telescope “Sibir” were used.

- binocular “Nikon Aculon 10x50”
- binocular “Nikon Action 10 x 50”
- binocular “Pentax 8x42”
- telescope “Bushnell” 20x-60x60mm Coated Optics Adjustable Focus Spotting Scope
- telescope 15-45X65 NITRO TM Spotting Scope
- telescope “Sibir20x-50x”;

Picture 5. Binocular “Pentax 8x42”

Various photo cameras and lenses used during field works in summer 2021:

- photo camera “Nikon D5600”
- photo camera “Nikon COOLPIX P900”
- photo camera “Nikon P610”
- photo camera “Canon PowerShot A2400 IS”
- photo camera “Sony DSC TX1”
- photo camera “Fujifilm FinePix XP70”
- *lens AF* Zoom-*NIKKOR 70-300mm* f/4-5.6G
- lens “Sigma” 150-600mm F5-6.3 DG OS HSM

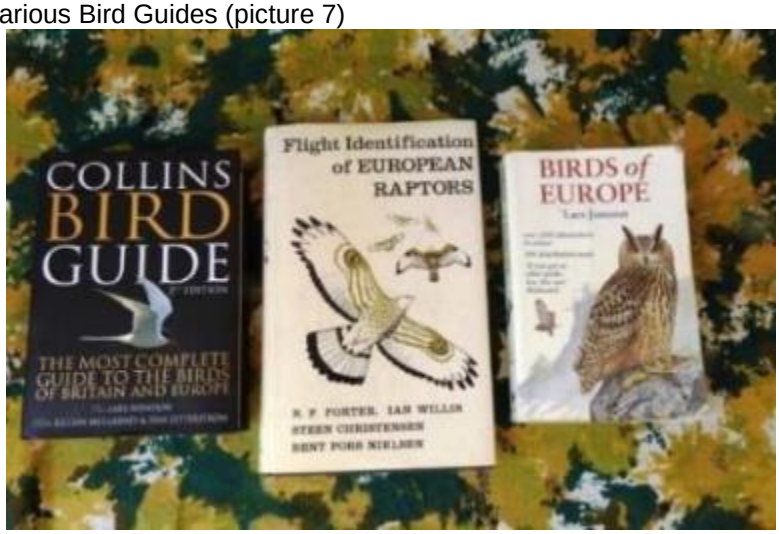
The rangefinders, optical rangefinder and laser rangefinder, were used to determine the flight height of birds, especially at high altitudes exceeding 100 m. If the flight altitude of individual individuals in migratory flocks was determined, then attention was focused on the extreme heights - minimum and maximum. The disadvantage of using rangefinders is that they provide accurate data when the bird is directly at its zenith. Low heights usually were determined visually. The following rangefinders used:

- Optical Rangefinder “Newcon LRM 1200 - 7x25”
- Laser Rangefinder "Vortex Ranger 1800"
- Laser Rangefinder “Leupold RX-1000” (picture 6)

Picture 6.

The following additional equipment was use during field works:

- various tripods for optical equipment
- GPS receiver “Garmin etrex”
- Walkie Talkie Radio 2 Two Way PMR 446 Midland G5 XT Long Range
- Olympus WS-853 Digital Voice Recorder
- Camouflage tent used during observations from vantage point
- Set of maps
- Various Bird Guides (picture 7)



Picture 7. Used bird guides

PART 3. RESULTS

In total, during the field works, carried out during nine calendar/working days from October 6 to October 26, 2021, at least 60 bird species have been recorded within the limits of Ruisi WPP Project Area and in adjacent areas, 18 – Non-Passerine bird species and 42 – Passerines. These birds are associated in the 23 families (9 - Non-Passerines and 14 - Passerines) that belong to 7 orders.

3.1. Systematic List of bird species recorded during ornithological monitoring carried out during the second half of autumn 2021 within the limits of Ruisi WPP Project Area and in adjacent areas

Systematic list of the recorded bird species with the basic information on the status of presence and conservation status of the each bird species presented below.

The following (one or more) categories selected for classification of the status of bird species, which occurred within the limits of study area (keys to the List):

Status of presence:
- YR-R = year-round resident, breeding species, present throughout of all seasons of year;
- YR-V = year-round visitor, non-breeding bird, present throughout of all seasons of year;
- SB = summer breeder or breeding species, present in breeding season and absent during non-breeding period;
- SV = summer visitor; non-breeder, present in spring and summer;
- PM - passage migrant (passage visitor) - bird on regular seasonal passage, present
- WV - winter visitor, non-breeding, present in late autumn, winter and early spring;
- OV - occasional visitor (or vagrant species) - recorded only several times; unexpected because normal distribution range is very distant from Project Area.
- ND = Not defined; found but its status not known yet.
- FB = Former breeder; breeding in the past; breeding has not been confirmed more than last 10 years.

Conservation Status – IUCN Red List Categories (first symbol)/ Georgia red List Categories (second symbol):

- **CR = Critically Endangered**
- **EN = Endangered**
- **VU = Vulnerable**
- **NT = Near Threatened**
- **LC = Least Concern**

A. NON-PASSERINES – 17 species

ORDER I. Birds of Prey (*FALCONIFORMES*) - 11 species

Family I/1. Buzzards, etc (*Accipitridae*) - 10 species

1. Black Kite (*Milvus migrans*) ძერა
Status of presence PM / Conservation Status: LC

2. Short-toed Snake-eagle (*Circaetus gallicus*) ძერაბოტი (გველიჭამია არწივი)
Status of presence PM / Conservation Status: LC

3. Eurasian Sparrowhawk (*Accipiter nisus*) მიმინო
Status of presence SV, PM, WV / Conservation Status: LC

4. Northern Goshawk (*Accipiter gentilis*) ქორი
Status of presence PM, WV / Conservation Status: LC

5. Common Buzzard (*Buteo buteo*) ჩვეულებრივი კაკაჩა
Status of presence PM, YR-V, WV / Conservation Status: LC

6. Long-legged Buzzard (*Buteo rufinus*) ველის კაკაჩა (გრძელკუდა კაკაჩა)
Status of presence PM YR-V LC / Conservation Status: VU

7. Rough-legged Buzzard (*Buteo lagopus*)
Status of presence PM, WV / Conservation Status: LC

8. Western Marsh Harrier (*Circus aeruginosus*) ჭაობის ბოლობეჭედა
Status of presence PM / Conservation Status: LC

9. Northern Harrier (*Circus cyaneus*) მინდვრის ბოლობეჭედა
Status of presence PM, WV / Conservation Status: LC

10. Montagu's Harrier (*Circus pygargus*) მდელოს ბოლობეჭედა
Status of presence PM / Conservation Status: LC

Family I/2. Falcons (*Falconidae*) - 1 species

11. Common Kestrel (*Falco tinnunculus*) ჩვეულებრივი კირკიტა
Status of presence PM, SV / Conservation Status: LC

ORDER II. *COLUMBIFORMES* - 1 species

Family II/1. Pigeons and Doves (*Columbidae*) - 1 species

12. Feral Pigeon (*Columba livia f. domesticus*) მტრედი
Status of presence YR-V / Conservation Status: LC

ORDER VI. *STRIGIFORMES* - 1 species

Family III/1. Owls (*Strigidae*) - 1 species

13. Little Owl (*Athene noctua*) ჭოტი
Status of presence YR-R / Conservation Status: LC

ORDER IV. *CAPRIMULGIFORMES*- 1 species

Family IV/1. Nightjars (*Caprimulgidae*)

14. Eurasian Nightjar (*Caprimulgus europaeus*) ჩვეულებრივი უფეხურა
Status of presence SB, PM / Conservation Status: LC

ORDER V. *CORACIIFORMES* - 3 species

Family V/1. Bee-eaters (*Meropidae*) - 1 species

15. European Bee-eater (*Merops apiaster*) ოქროსფერი კვირიონი
Status of presence SV, PM / Conservation Status: LC

Family V/2. Rollers (*Coraciidae*)- 1 species

16. European Roller (*Coracias garrulus*) ჩვეულებრივი ყაპყაპი
Status of presence SV, PM / Conservation Status: LC

Family V/3. Hoopoes (*Upupidae*) - 1 species

17. Eurasian Hoopoe (*Upupa epops*) ოფოფი

Status of presence SB, PM / Conservation Status: LC

ORDER VI. *PICIFORMES* - 1 species

Family VI/1. Woodpeckers (*Picidae*) - 1 species

18. Lesser Spotted Woodpecker (*Dendrocopos minor*) მცირე ჭრელი კოდალა

Status of presence YR-R / Conservation Status: LC

Order VII. *PASSERIFORMES* - 42 species

Family VII/1. Larks (*Alaudidae*) - 6 species

19. Lesser Short-toed Lark (*Calandrella rufescens*) მცირე მოკლეთითა ტოროლა

Status of presence SB, PM / Conservation Status: LC

20. Calandra Lark (*Melanocorypha calandra*) ველის ტოროლა

Status of presence SB, PM / Conservation Status: LC

21. Greater Short-toed Lark (*Calandrella brachydactyla*) დიდი მოკლეტიტა ტოროლა

Status of presence SB, PM / Conservation Status: LC

22. Woodlark (*Lullula arborea*) ტყის ტოროლა

Status of presence SB, PM / Conservation Status: LC

23. Eurasian Skylark (*Alauda arvensis*) მინდვრის ტოროლა

Status of presence SB, PM / Conservation Status: LC

24. Crested Lark (*Galerida cristata*) ქოცორა ტოროლა

Status of presence SB, PM / Conservation Status: LC

Family VII/2. Swallows and Martins (*Hirundinidae*) - 2 species

25. Barn Swallow (*Hirundo rustica*) სოფლის მერცხალი

Status of presenceSB, SV, PM / Conservation Status: LC

26. Northern House Martin (*Delichon urbica*) ქალაქის მერცხალი

Status of presence SV, SB, PM/ Conservation Status: LC

Family VII/3. Wagtails and Pipits (*Motacillidae*) - 4 species

27. Tree Pipit (*Anthus trivialis*) ტყის მწყერჩიტა

Status of presence SB, PM / Conservation Status: LC

28. Tawny Pipit (*Anthus campestris*) მინდვრის მწყერჩიტა

Status of presenceSB, PM / Conservation Status: LC

29. Pied, or White, Wagtail (*Motacilla alba*) თეთრი ბოლოქანქარა

Status of presence YR-V, SB, PM / Conservation Status: LC

30. Yellow Wagtail (*Motacilla flava*) ყვითელი ბოლოქანქარა

Status of presence SV(SB?) PM / Conservation Status: LC

Family VII/4. Warblers (*Sylvidae*) - 3 species

31. Common Whitethroat (*Sylvia communis*) დიდი ტეთრყელა ასპუწაკა

Status of presence SB, PM / Conservation Status: LC

32. Blackcap (*Sylvia atricapilla*) შავთავა ასპუწაკა

Status of presence SB, PM / Conservation Status: LC

33. Common Chiffchaff (*Phylloscopus collybita*) ჩვეულებრივი ყარანა

Status of presence SB, PM / Conservation Status: LC

Family VII/5. *Muscicapidae* – 8 species

34. Spotted Flycatcher (*Muscicapa striata*) რუხი მემატლია

Status of presence SB, PM/ Conservation Status: LC

35. Common Stonechat (*Saxicola torquata*) შავთავა ოვსადი

Status of presence SB, PM/ Conservation Status: LC

36. Whinchat (*Saxicola rubetra*) მდელოს ოვსადი

Status of presence SB, PM/ Conservation Status: LC

37. Northern Wheatear (*Oenanthe oenanthe*) ჩვეულებრივი მეღორღია
Status of presence PM/ Conservation Status: LC
38. Isabelline Wheatear (*Oenanthe isabellina*) ბუქნია-მეღორრია
Status of presence SB, PM/ Conservation Status: LC
39. Black-eared Wheatear (*Oenanthe hispanica*) შავყურა მეღორღია
Status of presence SB, PM/ Conservation Status: LC
40. Common Redstart (*Phoenicurus phoenicurus*) ჩვეულებრივი ბოლოცეცხლა
Status of presence SB, PM/ Conservation Status: LC
41. European Robin (*Erithacus rubecula*) გულწითელა
Status of presence YR-R/ Conservation Status: LC

Family VII/6. Thrushes (*Turdidae*) - 2 species
42. Common Blackbird (*Turdus merula*) შაშვი
Status of presence YR-R/ Conservation Status: LC
43. Mistle Thrush (*Turdus viscivorus*) ჩხარტვი
Status of presence SB?, PM, WV / Conservation Status: LC

Family VII/7. Long-tailed Tits (*Aegithalidae*) - 1 species
44. Long-tailed Tit (*Aegithalos caudatus*) თოხიტარა
Status of presence YR-R / Conservation Status: LC

Family VII/8. Tits (*Paridae*) - 2 species
45. Great Tit (*Parus major*) დიდი წივწივა
Status of presence YR-R / Conservation Status: LC
46. Blue Tit (*Parus caeruleus*) წიწკანა
Status of presence YR-R / Conservation Status: LC

Family VII/9. Wrens (*Troglodytidae*) - 1 species
47. Winter Wren (*Troglodytes troglodytes*) ჭინჭრაქა (ღობემძვრალა)
Status of presence YR-R / Conservation Status: LC

Family VII/10. Sparrows (*Passeridae*) - 2 species
48. Tree Sparrow (*Passer montanus*) მინდვრის ბეღურა
Status of presence YR-R / Conservation Status: LC
49. House Sparrow (*Passer domesticus*) სახლის ბეღურა
Status of presence YR-R / Conservation Status: LC

Family VII/11. Starlings (*Sturnidae*) - 1 species
50. Common Starling (*Sturnus vulgaris*) შოშია (შროშანი)
Status of presence YR-V, SB, PM, WV / Conservation Status: LC

Family VII/12. Crows (*Corvidae*) - 5 species
51. Eurasian Jay (*Garrulus glandarius*) ჩხიკვი
Status of presence YR-R / Conservation Status: LC
52. Magpie (*Pica pica*) კაჭკაჭი
Status of presence YR-R / Conservation Status: LC
53. Rook (*Corvus frugilegus*) ჭილყვავი
Status of presence PM, WV / Conservation Status: LC
54. Hooded Crow (*Corvus cornix*) რუხი ყვავი
Status of presence YR-R / Conservation Status: LC
55. Common Raven (*Corvus corax*) ყორანი
Status of presence YR-R / Conservation Status: LC

Family VII/13. Finches (*Fringillidae*) - 3 species
56. Common Chaffinch (*Fringilla coelebs*) სკვინჩა (ნიბლია)
Status of presence YR-R/ Conservation Status: LC
57. European Greenfinch (*Carduelis chloris*) მწვანულა
Status of presence YR-R / Conservation Status: LC
58. European Goldfinch (*Carduelis carduelis*) ჩიტბატონა
Status of presence YR-R. PM, WV/ Conservation Status: LC

Family VII/14. Buntings (*Emberizidae*) - 2 species
59. Black-headed Bunting (*Emberiza melanocephala*) შავტავა გრატა
Status of presence SB, PM/ Conservation Status: LC
60. Corn Bunting (*Milaria calandra*) მეფეტვია
Status of presence SB, PM/ Conservation Status: LC

3.2. Results of survey of target bird species carried out in autumn 2021

In total, at least 549 individuals of 12 target species, or Birds of Prey (*Falconiformes*) and Owls (*Strigiformes*), which considered as a target species, recorded during 2021 autumn surveys carried out within the limits of Ruisi WPP Project Area and in adjacent areas.

At least 297 individuals of 7 w species counted during direct visual observations carried out two vantage points. At least 193 individuals of 6 raptor species and 2 individuals of the Little Owl counted during surveys on foot. Besides that, 63 individuals of 6 raptor species observed during road-car surveys carried out in study area in October 2021.

The following 11 species of the Birds of Prey which associated in the two families (*Accipitridae* – 10 species) and (*Falconidae* – 1 species) registered during field works:

ORDER - Birds of Prey (*FALCONIFORMES*) - 11 species

Family I/1. Buzzards, etc (*Accipitridae*) – 10 species

- Black Kite (*Milvus migrans*) მერა
- Short-toed Snake-eagle (*Circaetus gallicus*) მერაბოტი, სინონიმი - გველიჭამია არწივი
- Eurasian Sparrowhawk (*Accipiter nisus*) მიმინო
- Northern Goshawk (*Accipiter gentilis*) ქორი
- Common Buzzard (*Buteo buteo*) ჩვეულებრივი კაკაჩა
- Long-legged Buzzard (*Buteo rufinus*) ველის (გრძელფეხა) კაკაჩა
- Rough-legged Buzzard (*Buteo lagopus*) ფეხბანჯღვლიანი კაკაჩა
- Western Marsh Harrier (*Circus aeruginosus*) ჭაობის ბოლობეჭედა
- Northern Harrier (*Circus cyaneus*) მინდვრის ბოლობეჭედა
- Montagu's Harrier (*Circus pygargus*) მდელოს ბოლობეჭედა

Family I/2. Falcons (*Falconidae*) - 1 species

- Common Kestrel (*Falco tinnunculus*) ჩვეულებრივი კირკიტა

ORDER - Owls (*STRIGIFORMES*) - 1 species

Family Owls (*Strigidae*) - 1 species

- Little Owl (*Athene noctua*) ჭოტი

Factual materials on the raptor species presented below:

- The most widespread and numerous raptor species were the following two species:
  - Black Kite (*Milvus migrans*) – 216 individuals;
  - Common Buzzard (*Buteo buteo*) – 165 individuals;
- Widespread and common, but not numerous, were the following species:
  - Eurasian Sparrowhawk (*Accipiter nisus*) – 56 individuals;
  - Common Kestrel (*Falco tinnunculus*) – 32 individuals;
  - Montagu's Harrier (*Circus pygargus*) – 27 individuals;
  - Western Marsh Harrier (*Circus aeruginosus*) – 14 individuals;
  - Long-legged Buzzard (*Buteo rufinus*) –10 individuals;
- Other five raptor species and one owl species were very rare in small numbers visitors:

Northern Harrier (*Circus cyaneus*) – 7 individuals;

- Lesser Spotted Eagle (*Aquila pomarina*) – 6 individuals;
- Short-toed Snake-eagle (*Circaetus gallicus*) – 6 individuals;
- Northern Goshawk (*Accipiter gentilis*) - 2 individuals;
- Little Owl (*Athene noctua*) – 2 individuals
- Rough-legged Buzzard (*Buteo lagopus*) – 1 individual

Besides that, 3 unidentified buzzards (*Buteo* spp.?) and 8 harriers (Hen/Montagu's/Pallid *Circus* spp.?) recorded in autumn 2021.

More detailed data on the results of survey of target bird species presented below in the list of counted individuals by days, tables 1, 2 and 3, as well as in the lists of counted individuals of birds of prey from vantage point, and in reviews on the separate target bird species.

Table 1. Results of count of target species from vantage point

Bird species	Dates and numbers of individuals									Total
	6 Oct	9 Oct	11 Oct	15 Oct	18 Oct	20 Oct	22 Oct	24 Oct	26 Oct	
Black Kite *Milvus migrans*	10	19	24	14	21	17	3	12	9	**129**
Short-toed Eagle *Circaetus gallicus*	1	2	1	-	-	-	-	-	-	**4**
Northern Goshawk *Accipiter gentilis*	-	-	-	-	-	-	-	1	1	**2**
Eurasian Sparrowhawk *Accipiter nisus*	5	5	2	7	4	1	1	3	1	**29**
Common Buzzard *Buteo buteo*	17	11	6	8	10	12	2	5	7	**78**
Long-legged Buzzard *Buteo rufinus*	-	2	-	1	2	-	-	-	3	**8**
Rough-legged Buzzard *Buteo lagopus*	-	-	-	-	-	-	-	-	1	**1**
Unidentified buzzards (Buteo/Pernis) species	-	-	-	-	1	-	-	-	1	**2**
Western Marsh Harrier *Circus aeruginosus*	1	1	-	-	3	-	-	-	1	**6**
Northern (Hen) Harrier *Circus cyaneus*	-	-	-	-	-	1	1	-	2	**4**
Montagu's Harrier *Circus pygargus*	2	3	1	4	-	1	-	2	1	**14**
Unidentified harriers *Circus* spp. ?	1	-	1	-	-	1	2	-	-	**5**
Common Kestrel *Falco tinnunculus*	6	2	1	-	1	-	1	2	2	**15**
TOTAL:	43	45	36	34	42	33	10	25	29	**297**

Table 2. Results of count of target species during surveys on foot

Bird species	Dates and numbers of individuals									Total
	6 Oct	9 Oct	11 Oct	15 Oct	18 Oct	20 Oct	22 Oct	24 Oct	26 Oct	
Black Kite *Milvus migrans*	11	8	5	12	12	7	-	5	8	**68**
Short-toed Eagle *Circaetus gallicus*	-	2	-	-	-	-	-	-	-	**2**
Eurasian Sparrowhawk *Accipiter nisus*	4	3	2	3	2	1	1	3	3	**22**
Common Buzzard *Buteo buteo*	14	7	6	8	10	9	2	5	7	**68**
Long-legged Buzzard *Buteo rufinus*	-	-	-	1	1	-	-	-	-	**2**
Western Marsh Harrier *Circus aeruginosus*	2	-	-	2	1	-	-	-	-	**5**
Northern (Hen) Harrier *Circus cyaneus*	-	-	-	-	-	-	-	1	1	**2**
Montagu's Harrier *Circus pygargus*	1	4	2	1	-	1	-	-	-	**9**
Unidentified harriers *Circus* spp. ?	-	-	-	-	-	-	1	-	-	**1**

Common Kestrel *Falco tinnunculus*	2	1	1	3	1	3	-	1	-	**12**
Little Owl *Athene noctua*	1	-	-	-	-	-	-	1	-	**2**
TOTAL:	35	25	16	30	27	21	4	16	19	**193**

Table 2. Results of count of target species during road-car surveys

Bird species	Dates and numbers of individuals									**Total**
	6 Oct	9 Oct	11 Oct	15 Oct	18 Oct	20 Oct	22 Oct	24 Oct	26 Oct	
Black Kite *Milvus migrans*	4	3	3	-	2	5	-	4	2	**23**
Eurasian Sparrowhawk *Accipiter nisus*	2	-	1	-	-	1	-	-	1	**5**
Common Buzzard *Buteo buteo*	5	2	4	1	2	1	-	3	1	**19**
Unidentified buzzards (Buteo/Pernis) species	-	-	-	-	-	1	-	-	-	**1**
Western Marsh Harrier *Circus aeruginosus*	1	-	-	1	1	-	-	-	-	**3**
Northern (Hen) Harrier *Circus cyaneus*	-	-	-	-	-	-	-	1	-	**1**
Montagu's Harrier *Circus pygargus*	1	1	1	-	1	-	-	-	-	**4**
Unidentified harriers *Circus* spp.?	-	-	-	1	-	-	-	1	-	**2**
Common Kestrel *Falco tinnunculus*	3	-	1	-	1	-	-	-	-	**5**
TOTAL:	16	6	10	3	7	8	0	9	4	**63**

3.3. Detailed review on the separate target species

This chapter provides only general information about the target bird species counted during monitoring works carried out within the limits of Ruisi WPP as well as in adjacent areas from October 6 to October 26, 2021. Detailed information about each record, indicating the exact location of observation, the time and duration of the separate bird's presence in the field of view, the altitude and direction of their flights, behavioral features, etc., was dictated to a Digital Voice Recorder Olympus WS-853 and will be used during the preparation of the final report and risks modelling of collision of birds with wind turbines at the territory of planned Wind Power Plant.

ORDER I. Birds of Prey (*FALCONIFORMES*) - 11 species

Family I/1. Buzzards, etc (*Accipitridae*) - 10 species

1. Black Kite (*Milvus migrans*) მერა - Widespread and common passage visitor (picture 8). In autumn 2021 was the most numerous, dominant target species. At least 216 counted in October 2021 within the limits of “Ruisi WPP” Project Area and about 150 watched in adjacent areas. At least 129 individuals observed from vantage point, 68 individuals recorded during survey on foot and 23 individuals during road-car survey. Max day-counts were on October 18 (n-35), on October 11 (n-32) and on October 9 (n-30). From 1500 to 2500 individuals are considered to migrate across territory of “Ruisi WPP PA per full autumn season. Usually observed flying at height 100 - 200 and more metres, rarely lower. The general directions of flight were south-western (about 80%), southern (about 15%) and western (about 5%).

Picture 8. Black Kite, *Milvus migrans*; October 24, 2021

2. Short-toed Snake-eagle (*Circaetus gallicus*) მერაბოტი, სინონიმი - გველიჭამია არწივი - Widespread and common, but in general not numerous, passage visitor across monitored area and rare in small numbers summer visitor without breeding. No evidence on breeding in the area under consideration. Probably in small numbers breeds in adjacent areas. Only 6 solitary individuals recorded in autumn 2021, including 4 individuals observed from vantage point; 2 individuals watched during surveys on foot. More often observed flying at heights from 100 to 200 m above the relief.

3. Eurasian Sparrowhawk (*Accipiter nisus*) მიმინო - Widespread and common passage visitor and irregular winterer to all sections of Ruisi WPP Project Area as well as to adjacent areas (picture 9). Autumn transit lasts from late August to early November, with a peak in the first half of October. At least 56 individuals counted during survey, including at least 29 individuals observed from vantage point. 22 individuals recorded during surveys on foot and 5 – during road-car surveys. Additionally, 18 individuals watched in adjacent areas. More often recorded near woodlands of various types (picture 10). Usually About 4/5 (n-45) were females and only about 1/5 (n-11) were males. Always observed by solitary individuals. The highest day-count noted on October 18 (n-10), on October 9 (n-8), on October 6 (n-5). Commonly watched flying at height 20 - 100 m above the relief, rarely lower or higher. The general directions of autumn passage across study area were southern and southwestern. From 500 to 1500 individuals considered to migrate across territory of “Ruisi WPP PA per full autumn season.

Picture 9. Eurasian Sparrowhawk (*Accipiter nisus*), female; October 26, 2021

Picture 10. Typical hunting habitats of Eurasian Sparrowhawk (*Accipiter nisus*) in south-eastern part of study area; October 18, 2021

4. Northern Goshawk (*Accipiter gentilis*) ქორი - Regular, but in small numbers, transit migrant and winter visitor. Always observed by solitary individuals. Only two solitary individuals recorded during survey – on October 24, 2021 (female) and on October 26, 2021 (male).

5. Common Buzzard (*Buteo buteo*) ჩვეულებრივი კაკაჩა - Widespread and numerous passage visitor, common, but not numerous, non-breeding summer visitor to area under consideration, common migratory breeder in woodlands, adjacent with study area and irregular in small numbers winterer (picture 11). Recorded in all parts of study area, in wide range of habitats, but prefers mosaic landscapes where forests alternate with open and semi-open areas. More often observed in fields and pastures with sparse vegetation, along edge of artificial pine forests (pictures 12, 13 and 14). At least 165 individuals counted within the limits of Ruisi WPP Project Area during survey in autumn 2021 and about 120 individuals observed in adjacent areas. 78 individuals observed from vantage point, 68 individuals recorded during survey on foot and 19 individuals during road-car survey. From 1000 to 2000 individuals are considered to migrate across territory of “Ruisi WPP PA per full autumn season. Usually observed flying at height 100 - 250 metres, rarely lower or higher. The general directions of flight were south-western (about 2/3) and southern (about 1/3). Buzzards, hunting on small rodents, several times observed in fields in central parts of monitored area.

Picture 11. Common Buzzard (*Buteo buteo*); October 11, 2021

Picture 12. Hunting habitats of Common Buzzard (*Buteo buteo*) in the central part of study area; October 9, 2021

Picture 13. Hunting habitats of Common Buzzard (*Buteo buteo*) in the northern part of study area; October 22, 2021

Picture 14. Hunting habitats of Common Buzzard (*Buteo buteo*) in the eastern part of study area; October 24, 2021

6. Long-legged Buzzard (*Buteo rufinus*) ველის (გრძეკფეხა) კაკაჩა - Common, but in small numbers, transit migrant (picture 15). Rare in small numbers breeds in adjacent areas – in the eastern and central parts of the Kvernaki Ridge. 10 solitary individuals counted in October 2021, including 8 individuals observed from vantage point. 2 individuals recorded during survey on foot. Usually these raptors watched flying at heights 50 - 150 m, rarely higher or hunting in fields in the central part of study area (picture 16).

Picture 15. Long-legged Buzzard (*Buteo rufinus*); October 18, 2021

Picture 16. Hunting habitats of Long-legged Buzzard (*Buteo rufinus*); October 9, 2021

7. Rough-legged Buzzard (*Buteo lagopus*) ფეხბანჯღვლიანი კაკაჩა - Irregular in small numbers passage visitor and common, but not numerous winterer. Only one individual recorded during survey in autumn 2021 – this raptor observed on October 26 in north-eastern part of study area flying to western direction at height about 75 - 80 m above the terrain (picture 17). Besides that, two solitary individuals recorded in adjacent areas, in fields' 500 – 700 m south-west of the Kareli town.

Picture 17. Rough-legged Buzzard (*Buteo lagopus*); October 26, 2021

8. Montagu's Harrier (*Circus pygargus*) მდელოს ბოლობეჭედა - Widespread and common passage visitor to all sections of the Ruisi WPP Project area as well as to adjacent areas (picture 18). Occurs in open and semi-open habitats (picture 19). At least 27 individuals, 10 females, 7 males and 10 immatures, recorded in Project Area. Besides that, 22 individuals observed in adjacent areas. Never forms flocks, always observed by solitary individuals. Usually watched flying at height from 10 - 50 m, rarely higher. The main directions of autumn migration across area under consideration were as south-western (3/4) and southern (1/4).

Picture 18. Montagu's Harrier (*Circus pygargus*), young individual; October 24, 2021

Picture 19. Hunting habitats of Montagu's Harrier (*Circus pygargus*); October 24, 2021

9. Western Marsh Harrier (*Circus aeruginosus*) ჭაობის ბოლობეჭედა - Widespread and more-or-less common, but not numerous, passage visitor (picture 20). 14 individuals, all solitary, counted during survey. 6 observed from vantage point, 5 individuals recorded during survey on foot and 3 individuals watched during road-car survey. Max day-counts were on October 6 (n-4) and on October 15 (n-3). From 200 to 300 individuals considered to migrate across territory of “Ruisi WPP PA per full autumn season. Usually observed flying at height 20 - 50 metres. The general directions of flight were south-eastern and southern.

Picture 20. Western Marsh Harrier (*Circus aeruginosus*), adult male; October 18, 2021

10. Northern Harrier (*Circus cyaneus*) მინდვრის ბოლობეჭედა - Common, but not numerous, late autumn migrant and winter visitor (picture 21). 7 solitary individuals, 5 females and 2 males (pictures 21 and 22), recorded during autumn 2021 survey in monitored area. 4 individuals observed from vantage point, 2 – during survey on foot and 1 – during road-car survey. All records were in dry open habitats. Typically these raptors observed watched flying at heights 10 - 50 m, rarely higher.

Picture 21. Northern Harrier (*Circus cyaneus*), adult male; October 24, 2021

Picture 22. Northern Harrier (*Circus cyaneus*), adult female; October 22, 2021

Family I/2. Falcons (*Falconidae*) - 1 species

11. Common Kestrel (*Falco tinnunculus*) ჩვეულებრივი კირკიტა - Widespread and common non-breeding summer visitor and transit migrant; common breeding raptor species in adjacent areas (picture 23). At least 32 individuals recorded during autumn 2021 survey in all parts of area under consideration. 15 individuals observed from vantage point, 12 individuals recorded during survey on foot and 5 individuals during road-car survey. Besides that, 21 individuals counted in adjacent areas. More often observed in fields with sparse vegetation (pictures 24 and 25). From 500 to 1000 individuals considered to migrate across territory of "Ruisi WPP PA per full autumn season. Always observed by solitary individuals in open or semi-open habitats (pictures 24 and 25). Typically watched flying at height 20 – 50 m, rarely at 50 - 100m above the relief. No flight intensity noted during daylight hours, these birds flew from 9:00 a.m. to 6 p.m.

Picture 23. Common Kestrel (*Falco tinnunculus*)

Picture 24. Habitats of Common Kestrel (*Falco tinnunculus*) in northern part of study area; October 06, 2021

Picture 25. Fields with low grass are typical hunting habitats of Common Kestrel (*Falco tinnunculus*) in central part of study area; October 15, 2021

ORDER III. *STRIGIFORMES* - 1 species

Family III/1. Owls (*Strigidae*) - 1 species

12. Little Owl (*Athene noctua*) ჭოტი - Common year-round resident (picture 26). Two solitary individuals recorded in autumn 2021 – one on October 6 in south-western corner of study area near Bebnisi village and another was on October 24 in semi-destroyed outbuilding east of the Sasireti village.

Picture 26. Little Owl (*Athene noctua*); October 24, 2021

3.4. Other bird species

ORDER II. *COLUMBIFORMES* - 1 species

Family II/1. Pigeons and Doves (*Columbidae*) - 1 species

13. Feral Pigeon (*Columba livia f. domesticus*) მტრედი - Common year-round resident in some villages situated around borders of study area as well as in many human settlements in Shida Kartli Region. Irregular non-breeding visitor to monitored area. Small flocks, consisting 7 (on October 9, 2021) and 11 individuals (on October 24, 2021), watched feeding in fields and pastures and flying near south-eastern and eastern borders of study area.

ORDER IV. *CAPRIMULGIFORMES*- 1 species

Family IV/1. Nightjars (*Caprimulgidae*)

14. Eurasian Nightjar (*Caprimulgus europaeus*) უფეხურა - Common passage visitor, but the bulk of migrants fly through the territory under consideration at the middle-end of September, i.e. much earlier than the time when we began observations in the fall of 2021. Only one individual recorded during survey – on October 6, 2021 directly at the western border of monitored area in field with scattered low bushes near Sagholasheni village.

ORDER V. *CORACIIFORMES* - 3 species

Family V/1. Bee-eaters (*Meropidae*) - 1 species

15. European Bee-eater (*Merops apiaster*) ოქროსფერი კვირიონი - Widespread and numerous passage visitor across monitored area (picture 27). Several flocks, consisting from 10 to 50 individuals in each, totally ca. 350, observed flying across monitored area to southern, south-western and western directions at height 30 – 150 m on October 6, on October 9 and on October 11, 2021.

Picture 27. European Bee-eater (*Merops apiaster*)

Family V/2. Rollers (*Coraciidae*) - 1 species

16. European Roller (*Coracias garrulus*) ყაჭყაჭი - Widespread and common, but not numerous, passage visitor and rare non-breeding summer visitor to study area (picture 28). Probably breeds in small numbers in adjacent areas, but no evidence on breeding within the limits of “Ruisi WPP” Project Area. Seven solitary individuals observed during survey. Most of records were on October 9 (n-4) and October 6 (n-2). Birds observed flying at height from 20 to 50 m.

Picture 28. European Roller (*Coracias garrulus*)

Family V/3. Hoopoes (*Upupidae*) - 1 species

17. Eurasian Hoopoe (*Upupa epops*) ოფოფი - Widespread and common migratory breeder and passage visitor to all parts of study area as well as to adjacent areas. (Picture 29). Main part of migrants fly through the territory under consideration in September, i.e. earlier than we began field works in the autumn of 2021. Four solitary individuals recorded in October – 2 on October 6 and 2 on October 9. Besides that, three solitary individuals recorded in adjacent areas on October 6.

Picture 29. Eurasian Hoopoe (*Upupa epops*)

ORDER VI. *PICIFORMES* - 1 species

Family VI/1. Woodpeckers (*Picidae*) - 1 species

18. Lesser Spotted Woodpecker (*Dendrocopos minor*) მცირე ჭრელი კოდალა - More-or-less common year-round visitor without breeding. More common in adjacent areas. Outside of breeding season widely nomads and recorded in various habitats. Two solitary individuals observed in autumn 2021 – one watched feeding on dry pine in artificial pine forest in south-eastern corner of study area on October 18 (picture 30) and another observed in garden in Breti village on October 22.

Picture 30. Feeding habitats of Lesser Spotted Woodpecker (*Dendrocopos minor*) in south-eastern corner of study area; October 18, 2021

Order VII. *PASSERIFORMES* - 42 species

Family VII/1. Larks (*Alaudidae*) - 6 species

19. Lesser Short-toed Lark (*Calandrella rufescens*) მცირე მოკლეთითა ტოროლა - Widespread and common migratory breeder and passage visitor. Inhabits open habitats in all parts of study area. Not counted.

20. Calandra Lark (*Melanocorypha calandra*) ველის ტოროლა - Widespread and common transit migrant and migratory breeder. Recorded in all parts of study area except woodlands and villages. During autumn passage observed in open habitats of various types by flocks consisting from 10 to 20 individuals. At least 300 individuals watched in October 2021.

21. Greater Short-toed Lark (*Calandrella brachydactyla*) დიდი მოკლეტიტა ტოროლა - Widespread and common, but in general not numerous, passage visitor and migratory breeder. More often recorded in dry fields with sparse vegetation by small flocks consisting 5 – 10, rarely more, individuals. About 120 individuals counted during field works in autumn 2021. Most of records were in fields of central part of study area.

22. Woodlark (*Lullula arborea*) ტყის ტოროლა - Widespread and common passage visitor and common, but in small numbers, migratory breeder in woodlands. More common in adjacent areas. Several tens observed during field works in October 2021.

23. Eurasian Skylark (*Alauda arvensis*) მინდვრის ტოროლა - Widespread and numerous transit migrant and migratory breeder (picture 31). Inhabits open and semi-open habitats (fields, meadows, pastures) in all parts of the area under consideration, not counted.

Picture 31. Eurasian Skylark (*Alauda arvensis*)

24. Crested Lark (*Galerida cristata*) ქოცორა ტოროლა - Widespread and common year-round non-breeding visitor. Three small flocks, consisting from 5 to 10 individuals in each, and several solitary individuals, totally ca, 25, were observed feeding in fields on October 9, October 15, October and October 22, 2021.

Family VII/2. Swallows and Martins (*Hirundinidae*) - 2 species

25. Barn Swallow (*Hirundo rustica*) სოფლის მერცხალი - Widespread and common passage visitor and migratory breeder to all sections of study area. About 270 individuals observed during survey,

mostly on October 6 and October 9, 2021. All swallows watched flying at heights from 20 to 150 m above the relief to southern and southwestern directions.

26. Northern House Martin (*Delichon urbica*) ქალაქის მერცხალი - Widespread and common transit migrant to all parts of study area. Breeds in all human settlements situated around "Ruisi WPP" Project Area. Numerous flocks, consisting from 10 to 50 individuals in each, watched on October 6 and on October 9 flying southern and south-western directions at height from 5 to 100 m above the relief. No data on total number of transients crossed monitored area during autumn passage.

Family VII/3. Wagtails and Pipits (*Motacillidae*) - 4 species

27. Tree Pipit (*Anthus trivialis*) ტყის მწყერჩიტა - Widespread and common migratory breeder and passage visitor. Inhabits woodlands of various types, including artificial pine forests, protective tree lines along roads, gardens in villages, etc. The most preferable habitats are edges of woodlands. Several tens observed during survey, mostly in and near artificial pine forests and in gardens.

28. Tawny Pipit (*Anthus campestris*) მინდვრის მწყერჩიტა - Widespread and common migratory breeder and passage visitor. Inhabits dry fields with scattered bushes and solitary low trees. More common and numerous in cultivated fields, pastures and at gentle tree-less slopes in eastern and southern parts of monitored area. At least 200 individuals watched in the first half of October, mostly on October 6 and on October 9. No data on total number of migrants.

29. Pied, or White, Wagtail (*Motacilla alba*) თეთრი ბოლოქანქარა - Widespread and common passage visitor to all parts of monitored area and common, but not numerous, migratory breeder to some parts of Project Area. About 30 individuals recorded during autumn 2021 survey, most of records were in or near villages

30. Yellow Wagtail (*Motacilla flava*) ყვითელი ბოლოქანქარა - Common passage visitor. Six solitary individuals observed in various parts of study area, mostly at wet plots in fields and orchards near villages.

Family VII/4. Warblers (*Sylvidae*) - 3 species

31. Common Whitethroat (*Sylvia communis*) დიდი ტეთრყელა ასპუჭაკა - Common migratory breeder and passage visitor. Prefers lighted up and rarefied plots of woodlands with glades and saved undergrowth. Seven solitary individuals recorded during autumn 2021 survey, mostly in south-eastern part of study area near artificial pine forests.

32. Blackcap (*Sylvia atricapilla*) შავთავა ასპუჭაკა - Widespread and common migratory breeder and passage visitor. Recorded in wide variety of habitats, but more often in open and semi-open woodlands, along forest edges with dense bushes, in fields with grouped high dense bushes. About 15 individuals recorded during survey, mostly on October 6, 2021.

33. Common Chiffchaff (*Phylloscopus collybita*) ჩვეულებრივი ყარანა - Widespread and common passage visitor. Always recorded by solitary individuals in fields with dense bushes and near artificial pine forests. At least 10 watched in October 2021.

Family VII/5. *Muscicapidae* – 8 species

34. Spotted Flycatcher (*Muscicapa striata*) რუხი მემატლია - Widespread and common migratory breeder and passage visitor (picture 32). Recorded in various habitats preferring artificial pine forest edge (picture 33). About 20 individuals observed during autumn 2021 survey, mostly in the first half of October.

Picture 32. Spotted Flycatcher (*Muscicapa striata*)

Picture 33. Habitats of Spotted Flycatcher (*Muscicapa striata*) in southern part of study area; October 9, 2021

35. Common Stonechat (*Saxicola torquata*) შავთავა ოვსადი - Widespread and quite common passage visitor (picture 34). Usually recorded in dry open and semi-open habitats, stony grasslands with rare low brushes. About 15 solitary individuals recorded during autumn 2021 survey. At least ¾ observations were on October 6 and October 9, 2021. More common in adjacent areas.

Picture 34. Common Stonechat (*Saxicola torquata*)

36. Whinchat (*Saxicola rubetra*) მდელოს ოვსადი - Widespread and common passage visitor and migratory breeder. Recorded in all sections of monitored area. About 30 individuals observed on October 6, on October 9 and on October 11. Most of records were on October 9, when at least 20 individuals watched in fields at plots with thick bushes along southern of study area.

37. Northern Wheatear (*Oenanthe oenanthe*) ჩვეულებრივი მეღორღია - Widespread and common passage visitor observed in open habitats in the whole of monitored area (picture 35). About 25 individuals counted during field works, most of records, at least ¾, were on October 9 and October 11, 2021.

Picture 35. Northern Wheatear (*Oenanthe oenanthe*), female; October 20, 2021

38. Isabelline Wheatear (*Oenanthe isabellina*) ბუქნია-მეღორღია - Widespread and common, but not numerous, passage visitor. About 15 individuals recorded in open habitats in the first half of October.

39. Black-eared Wheatear (*Oenanthe hispanica*) შავყურა მეღორღია - Widespread and common passage visitor. Nine solitary individuals on October 6 and two on October 11 recorded in hills with brushwood vegetation in southern and south-eastern parts of study area.

40. Common Redstart (*Phoenicurus phoenicurus*) ჩვეულებრივი ბოლოცეცხლა - Common passage visitor and migratory summer breeder. Observed various habitats, preferring artificial pine forests and in gardens near village. About 15 counted on October 6 and October 9, 2021.

41. European Robin (*Erithacus rubecula*) გულწითელა - Widespread and more-or-less common, but in general not numerous passage visitor, locally distributed, migratory breeder, or partial migrant and irregular winter visitor to some parts of study area (picture 36). 12 solitary individuals recorded in October 2021. Most of records were in artificial pine forests and in fields with dense bushes along southern limits of study area (picture 37).

Picture 36. European Robin (*Erithacus rubecula*)

Picture 37. Habitats of European Robin (*Erithacus rubecula*)

Family VII/6. Thrushes (*Turdidae*) - 2 species

42. Common Blackbird (*Turdus merula*) შაშვი - Widespread and common year-round resident to all parts of study area (picture 38). More common in adjacent areas. Recorded in semi-open habitats near villages, in gardens, fields with scattered and grouped low trees and high bushes, along edge of artificial pine forest. Not counted.

Picture 38. Common Blackbird (*Turdus merula*)

43. Mistle Thrush (*Turdus viscivorus*) ჩხართვი - Common transit migrant and year-round non-breeding visitor to monitored area. Observed in wide variety of habitats, more often in abandoned gardens, villages, near artificial woodlands. 14 solitary individuals and 1 pair recorded during survey. Max day-count was on October 9, 2021 (n-6).

Family VII/7. Long-tailed Tits (*Aegithalidae*) - 1 species

44. Long-tailed Tit (*Aegithalos caudatus*) თოხიტარა - Widespread and common, but in general not numerous, year-round visitor without breeding. Breeds in adjacent areas. Outside of the breeding seasons widely nomads. Observed by small flocks in various habitats in all parts of study area, more often watched in open woodlands, along forest edges, in gardens near villages, along roads, etc. About 20 individuals recorded during survey.

Family VII/8. Tits (*Paridae*) - 2 species

45. Great Tit (*Parus major*) დიდი წივწივა - Common, but not numerous, year-round resident with local seasonal movements. This bird species associated with in woodlands of various types (picture 39). More widespread and numerous in middle-aged and mature woodland in adjacent areas. About 20 individuals recorded in woodlands near Breti village, several were in gardens around Ruisi village and about 10 were in artificial pine forest in the southeastern corner of monitored area.

Picture 39. Artificial pine forests – typical habitats of Great Tit (*Parus major*)

46. Blue Tit (*Parus caeruleus*) წიწკანა - Widespread and common, but in general not numerous, year-round resident with local seasonal movements. Observed in wide variety of habitats, prefers hedgerows, bushy heats, dry open woodlands. Small flock, consisting at least 4 individuals, recorded near Bebnisi village and about 10 individuals were in other sections of study area.

Family VII/9. Wrens (*Troglodytidae*) - 1 species

47. Winter Wren (*Troglodytes troglodytes*) ჭინჭრაქა (ღობემძვრალა) - Common, but in general not numerous, year-round resident to wide variety of habitats. More widespread and numerous in adjacent areas. Five solitary individuals observed during survey in dense bushes along southern limits of monitored area and two were seen in abandoned gardens near Ruisi village.

Family VII/10. Sparrows (*Passeridae*) - 2 species

48. Tree Sparrow (*Passer montanus*) მინდვრის ბეღურა - Widespread and common year-round resident with local seasonal movements (picture 40). Recorded in wide variety of habitats. More often

observed in fields with solitary low trees and bushes, along roads, near villages, separate buildings, in ruins, etc. (picture 41).

Picture 40. Tree Sparrow (*Passer montanus*); October 11, 2021

Picture 41. Habitats of Tree Sparrow (*Passer montanus*); October 18, 2021

49. House Sparrow (*Passer domesticus*) სახლის ბეღურა - Common year-round resident to all parts of study area, more often recorded in and near villages. Breeds in all villages located around the monitored area. Not counted.

Family VII/11. Starlings (*Sturnidae*) - 1 species

50. Common Starling (*Sturnus vulgaris*) შოშია - Widespread and common year-round non-breeding visitor to all parts of study area. Several flocks, consisting from 10 to 25 individuals, totally ca. 100, observed during autumn 2021 survey.

Family VII/12. Crows (*Corvidae*) - 5 species - Eurasian Jay (*Garrulus glandarius*) ჩხიკვი

51. Widespread and common, but not numerous, year-round resident. More common in adjacent areas in various woodlands with plenty of trees, bushes, and undergrowth. Four times solitary individuals observed in and near artificial pine forest near southern border of study area (picture 42).

Picture 42. Habitats of Eurasian Jay (*Garrulus glandarius*)

52. Magpie (*Pica pica*) კაჭკაჭი - Widespread and common year-round resident to all parts of study area. From 15 to 25 individuals regularly presented in the monitored area in October 2021.

53. Rook (*Corvus frugilegus*) ჭილყვავი - Widespread and common late transit migrant and winter visitor (picture 43). Small flocks, consisting 10 - 25 individuals in each, totally ca. 150, recorded on October 18, October 20 and October 24, 2021. Rooks observed feeding in fields in all parts of monitored area (picture 44).

Picture 43. Rook (*Corvus frugilegus*); October 20, 2021

Picture 44. Typical feeding habitat of Rook (*Corvus frugilegus*) in southern part of study area; October 20, 2021

54. Hooded Crow (*Corvus cornix*) რუხი ყვავი - Common year-round resident to various habitats (pictures 45, 46 and 47). Not counted.

Picture 45. Hooded Crow (*Corvus cornix*); October 18, 2021

Picture 46. Habitats of Hooded Crow (*Corvus cornix*); October 18, 2021

Picture 47. Habitats of Hooded Crow (*Corvus cornix*); October 26, 2021

55. Common Raven (*Corvus corax*) ყორანი - Common year-round non-breeding visitor (picture 48). About 20 watched in autumn 2021.

Picture 48. Pair of Common Ravens (*Corvus corax*); October 11, 2021

Family VII/13. Finches (*Fringillidae*) - 3 species

56. Common Chaffinch (*Fringilla coelebs*) სკვინჩა (ნიბლია) – Widespread and common year-round resident with local seasonal movements, transit migrant and winter visitor (picture 49). Inhabits wide variety of woodlands. Outside of breeding season usually observed in flocks, varying in size from several individuals to hundreds. Small flocks sometimes composed of only one sex. Often mixed with other seed-eating birds, mostly with finches and sparrows. Number of individuals presented within the limits of study area fluctuated due of weather conditions. Not counted.

Picture 49. Common Chaffinch (*Fringilla coelebs*), female; October 24, 2021

57. European Greenfinch (*Carduelis chloris*) მწვანულა - Widespread and common passage visitor and migratory breeder. Observed in all parts of monitored area, but usually recorded open woodlands, cultivated fields with scattered trees and high bushes, artificial pine forest edges, gardens in and around villages, protective tree-belts along roads and in fields, etc. Not counted.

58. European Goldfinch (*Carduelis carduelis*) ჩიტბატონა - Widespread and common passage visitor and migratory breeder, irregular winter visitor (picture 50). Observed in all parts of monitored area. More often observed in semi-open habitats, along forest edges, roadsides, etc. (picture 51). Three flocks, consisting from 10 to 25 individuals in each, several small flock, consisting from 3 to 10 individuals, two pairs and about 10 solitary individuals, totally ca. 75 individuals, were counted recorded during survey;

Picture 50. European Goldfinch (*Carduelis carduelis*)

Picture 51. Typical habitats of European Goldfinch (*Carduelis carduelis*)

Family VII/14. Buntings (*Emberizidae*) - 2 species

59. Black-headed Bunting (*Emberiza melanocephala*) შავტავა გრატა - Widespread and common migratory breeder and transit migrant to dry open tree-less habitats of monitored area. 12 solitary individuals recorded on October 9, 5 – on October 11 and single on October 15, 2021.

60. Corn Bunting (*Miliaria calandra*) მეფეტვია - Widespread and common year-round resident, or partial migrant, and passage and winter visitor all parts of study area as well as to adjacent areas with highest density in open and semi-open habitats (picture 52). More often watched by solitary individuals or by small flocks in dry open woodlands, cultivated fields, pastures with scattered and grouped trees and high bushes. Not counted.

Picture 52. Corn Bunting (*Miliaria calandra*)

March 31, 2022
REPORT
TO JSC Wind Power

RUISI WIND POWER PLANT PROJECT

Ornithological Monitoring Report
Quarterly Report
for the Winter Period – January/February 2022

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1. Introduction

This Report has been prepared for the planned Ruisi Wind Power Plant (WPP) in Shida Kartli Region of Georgia.

The Monitoring comprised the area selected for the potential WPP and its environs.

The report is based on outcomes of the bird monitoring, and describes its schedule, methodology and detailed findings. The presented report covers the period of wintering of birds, or from January 20, 2022 to February 14, 2022.

2. Objectives of Ornithological Monitoring

The main objective of the survey was to collect baseline data on wintering birds within the limits of Ruisi WPP Project Area and in adjacent areas.

The specific objective of the study was to obtain information on the composition of wintering bird species, their status of presence, territorial distribution, habitat selection, numbers of presented

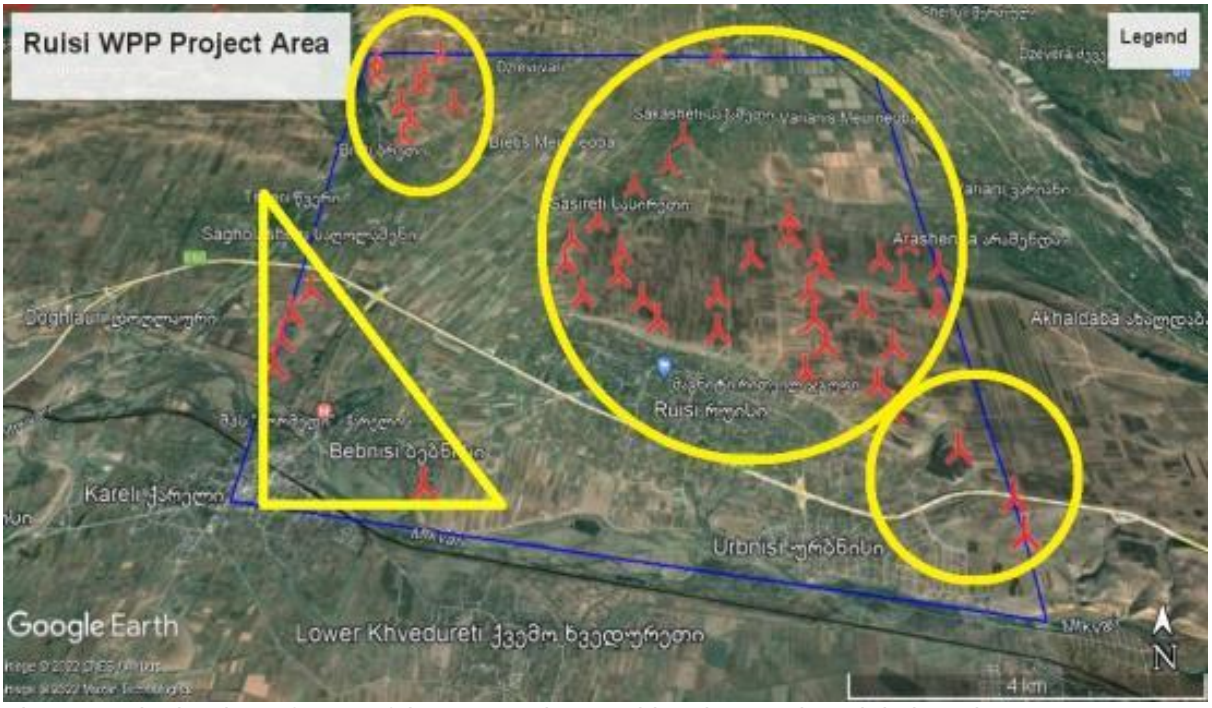
individuals, or densities, of solitary birds species, flight activity during wintering in the study area and some other aspects of winter Avifauna of area under consideration.

3. Survey Methodology

Field works in winter 2022 were carried out by professional zoologist - Dr. Alexander Abuladze from the Institute of Zoology, Ilia State University in co-operation with assistant and assistant/drivers and in some cases in assistance with amateur colleagues.

During the winter survey all parts of Ruisi WPP Project Area and the most important, from biodiversity point of view, sites in adjacent areas were visited and surveyed the course of study.

The parts of the Ruisi WPP Project Area in which winter 2022 survey was carried out is indicated by a yellow line on the picture 1.



Picture 1. The borders of parts of the area under consideration monitored during winter 2022 survey

Field works were conducted in more-or-less favourable, suitable, weather conditions, optimal for visual observations and identification of bird species, i.e. not during periods of strong winds, snowfalls and heavy rains.

Factual data were collected during 8 calendar/working days, using the combination of traditionally used methods direct visual observations from vantage (watching) point located at the high point of relief, survey on foot and road-car survey across and around area under consideration.

Of course, not all these listed methods were equally applied. In different parts of study area and depending on the specific weather conditions of a particular day and time of day, priority was given to the most useful method or to combination of different methods. But the basic method was direct visual observations from vantage point in combination with survey on foot.

The total duration of ornithological monitoring carried out within the limits of the Ruisi WPP Project Area in February 2020 during 8 (eight) calendar / working days between January 20, 2022 and February 14, 2022 was more 66 hours (66 hours and 5 minutes).

3.1. Schedule of field works in February 2020 at the Ruisi WPP Project area and in adjacent areas:

Field works planned for the Ornithological Monitoring of wintering birds for the Ruisi WPP Project Area comprised 8 (eight) calendar/ working days of winter 2022. Specific dates and duration of observations during each day are as follows:

- January 20, 2022; from 11:15 to 17:10 (5 hours and 55 minutes);
- January 24, 2022; from 09:20 to 17:45 (8 hours and 25 minutes);
- January 29, 2022; from 09:30 to 17:40 (8 hours and 10 minutes);
- January 31, 2022; from 09:15 to 17:00 (7 hours and 45 minutes);
- February 2, 2022; from 10:45 to 18:00 (7 hours and 15 minutes);
- February 5, 2022; from 09:00 to 17:45 (8 hours and 45 minutes);
- February 10, 2022; from 09:15 to 17:30 (8 hours and 15 minutes);
- February 14, 2022; from 08:40 to 18:15 (9 hours and 35 minutes).

So, the total duration of the winter 2022 Ornithological Monitoring carried out in January/February 2022 comprised 66 hours and 05 minutes.

3.2. Specifically, these included:

3.2.1. Vantage Point Surveys, or direct visual observations from vantage point [VP], located at high point of relief with optimal conditions for direct visual observations.

The vantage point survey methodology follows that described in the international best practice “Scottish Natural Heritage, 2014. Guidance. Recommended bird survey methods to inform impact assessment of wind farms”.

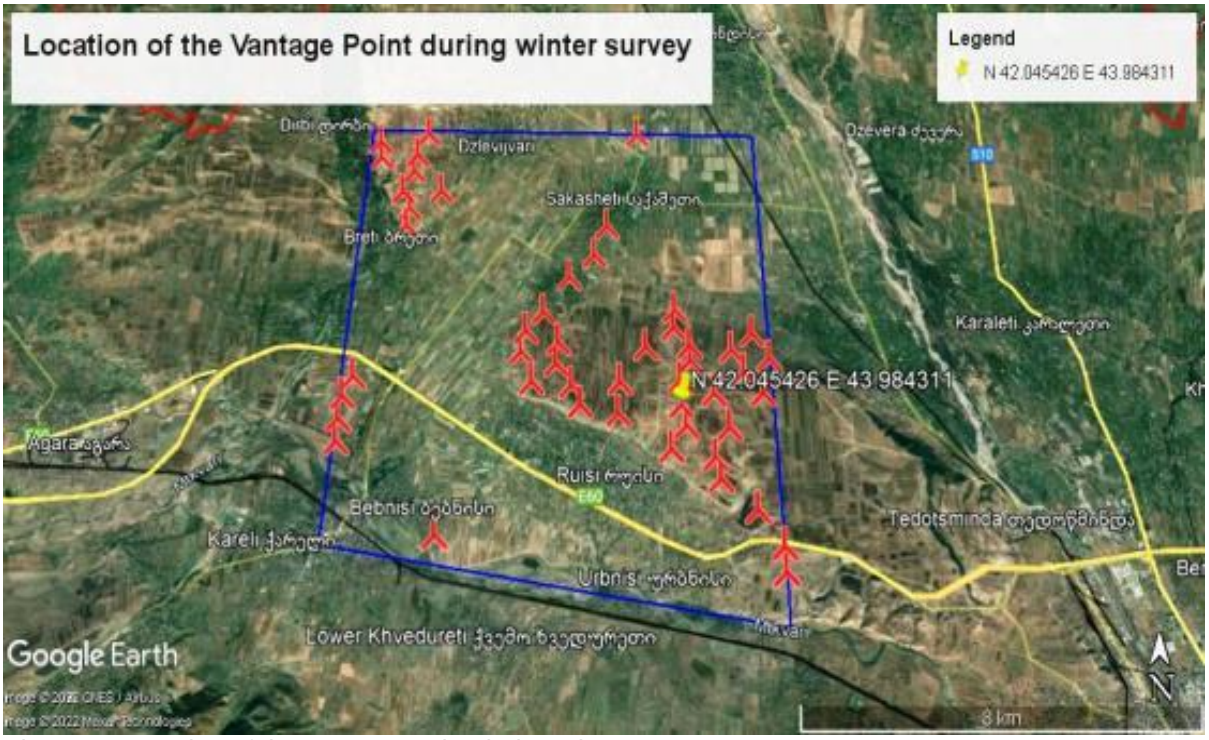
The Vantage Point surveys were carried out by two surveyors (expert together with assistants) experienced in the identification of birds of Georgia.

The total duration of Vantage Point surveys was around 17 hours.

The VP surveys in January - February 2022 were undertaken on the following dates (for details on the duration of direct visual observations from vantage point see information below):

- January 20, 2022; from 11:45 to 15:00 (3 hours and 15 minutes);
- January 24, 2022; from 10:30 to 14:15 (3 hours and 45 minutes);
- January 29, 2022; from 10:30 to 15:00 (4 hours and 30 minutes);
- January 31, 2022; from 11:10 to 14:30 (3 hours and 20 minutes);
- February 2, 2022; from 11:40 to 15:15 (3 hours and 35 minutes);
- February 5, 2022; from 10:15 to 14:40 (4 hours and 25 minutes);
- February 10, 2020; from 10:45 to 14:15 (3 hours and 30 minutes);
- February 14, 2022; from 11:00 to 14:15 (3 hours and 15 minutes).

Vantage point was located in the fields to the north of Ruisi village, i8n the site with coordinates: N 42.045426 E 43.984311 (picture 2).



Picture 2. Location of the Vantage point during winter survey

From the Vantage point, a very good view of the main part of project area and some sides of the adjoining territories opened up. In good weather, visibility from the vantage point was up to the horizon, which allowed us to see flying birds from a distance of 3 – 5 km and more.

The general views from vantage point presented in pictures 3, 4, 5 and 6.

Taking into account the peculiarities and difficulties of conducting winter observations in the open air, the necessary conditions have been prepared for convenience (pictures 7 and 8). Observers had the opportunity to periodically take turns in the car, where they could warm up and take hot tea and snacks.

Picture 3. View from vantage point to the eastern part of study area; January 24, 2022


Picture 4. View from vantage point to the south-eastern part of study area; January 24, 2022

Picture 5. View from vantage point to the western part of study area; February 5, 2022

Picture 6. View from vantage point to the northern part of study area; February 5, 2022

Pictures 7 and 8. Vantage point during winter survey; January 24, 2022.

3.2.2 surveys on foot across all parts of the Ruisi WPP Project Area as well as in adjacent areas (pictures 9 and 10). Surveys were conducted on foot throughout the daylight hours, commonly in the optimal for visual observations weather conditions. The duration of foot-survey was about 26 hours and 5 minutes. For details see schedule below:

- January 20, 2022; from 15:00 to 16:50 (1 hour and 50 minutes);
- January 24, 2022; from 14:15 to 17:30 (3 hours and 30 minutes);
- January 29, 2022; from 15:00 to 17:40 (2 hours and 40 minutes);
- January 31, 2022; from 09:45 to 11:10 (1 h and 25 m) and from 14:30 to 16:40 (2 h and 10 m), 3 hours and 35 minutes in total;
- February 2, 2020; from 15:15 to 18:00 (2 hours and 45 minutes);
- February 5, 2022; from 09:20 to 10:15 (55 m) and from 14:40 to 17:25 (2 h and 45 m), 3 hours and 40 minutes in total;
- February 10, 2022; from 09:30 to 10:45 (1 h and 15 m) and from 14:15 to 17:00 (2 h and 45 m), 4 hours in total;
- February 14, 2022; from 09:10 to 11:00 (1 h and 50 mi) and from 14:15 to 17:45 (3 h and 30 m), 5 hours and 20 minutes in total.

Pictures 9 and 10.

3.2.3. road-car surveys in open habitats with field glasses from a moving car across and around study area (picture 11). Road-car surveys were carried out with a series of frequent short stops from 5 to 30 minutes, 7 hours and 25 minutes in total. Stops were made mostly in high points or relief with optimal conditions for visual observations with binoculars or telescope (pictures 12 and 13). Car "Nissan xTerra" was used for road-car surveys.

For details see data below:

- January 20, 2022; from 11:15:to 11:45 (30 minutes) and from 16:50 to 17:10 (20 minutes), 50 minutes in total;
- January 24, 2022; from 09:20 to 10:30 (1 hour and 10 minutes) and from 17:30 to 17:45 (15 minutes), or 1 hour and 25 minutes in total;
- January 29, 2022; from 09:30 to 10:30 (1 hour);
- January 31, 2022; from 09:15 to 09:45 (30 minutes) and from 16:40 to 17:00 (20 minutes), 50 minutes in total;
- February 2, 2020; from 10:45 to 11:40 (55 minutes);
- February 5, 2022; from 09:00 to 09:20 (20 minutes) and 17:25 to 17:45 (20minutes), 40 minutes in total;
- February 10, 2020; from 09:15 to (15 minutes) and from 17:00 to 17:30 (30 minutes), 45 minutes in total;
- February 14, 2022; from 08:40 to 09:10 (30 minutes) and from 17:45 to 18:15 (30 minutes), 1 hour in total.

Picture 11.

4. Results

As might be expected, the Avifauna of wintering birds at the territory under consideration turned out to be extremely poor both in qualitative and quantitative terms.

In total, during 8 (eight) calendar/working days between January 20, 2022 and February 14, 2022, only 35 bird species were recorded within the limits of the Ruisi WPP Project Area and in adjacent areas. Among these 35 species, 12 species were non-passerines and other 23 bird species were passerines.

These 35 bird species are associated in five systematic orders and form about 8% of Avifauna of Georgia and around 1/5 of the bird species recorded in country during wintering.

The bird species accounts, taxonomic sequence and the all common (English) and scientific (Latin) names presented in this report are based on the latest accepted ornithological systematic and nomenclature.

4.1. Systematic List of the bird species recorded during field works carried out in Ruisi WPP Project Area in January - February 2022:

A. NON-PASSERINES – 12 species

Order I. Birds of Prey (*Falconiformes*) – 8 species

Family I – 1. Buzzards, etc (*Accipitridae*) - 6 species

1. Hen Harrier (*Circus pygargus*)
2. Goshawk (*Accipiter gentilis*)
3. Eurasian Sparrowhawk (*Accipiter nisus*)
4. Common Buzzard (*Buteo buteo*)
5. **Long-legged Buzzard** (*Buteo rufinus*)
6. Rough-legged Buzzard (*Buteo lagopus*)

Family I – 2. Falcons (*Falconidae*) - 2 species

7. Common Kestrel (*Falco tinnunculus*)
8. Merlin (*Falco columbarius*)

Order II. Pigeons and Doves (*Columbiformes*) – 1 species

Family II – 1. Pigeons and Doves (*Columbidae*) - 1 species

9. Feral Pigeon - *Columba livia f. domesticus*

Order III. Owls (*Strigiformes*) - 2 species

Family III – 1. Owls (*Strigidae*) - 2 species

10. Long-eared Owl (*Asio otus*)
11. Little Owl (*Athene noctua*)

Order IV. Peckers (*Piciformes*) - 1 species

Family IV - 1. Woodpeckers (*Picidae*) - 1 species

12. Great Spotted Woodpecker (*Dendrocopos major*)

B. PASSERINES

Order V. Passerines (*Passeriformes*) – 23 species

Family V - 1. Larks (*Alaudidae*) - 2 species

13. Calandra Lark (*Melanocorypha calandra*)
14. Crested Lark (*Galerida cristata*)

Family V - 2. Wagtails and Pipits (*Motacillidae*) - 2 species

15. Water Pipit (*Anthus spinoletta*)
16. White (Pied) Wagtail (*Motacilla alba*)

Family V - 3. Flycatchers (*Muscicapidae*) – 1 species

17. European Robin (*Erithacus rubecula*)

Family V - 4. Thrushes (*Turdidae*) - 2 species

18. Common Blackbird (*Turdus merula*)
19. Fieldfare (*Turdus pilaris*)

Family V - 5. Long-tailed Tits (*Aegithalidae*) - 1 species

20. Long-tailed Tit (*Aegithalos caudatus*)

Family V - 6. Tits (*Paridae*) - 2 species

21. Blue Tit (*Parus caeruleus*)
22. Great Tit (*Parus major*)

Family V - 7. Wrens (*Troglodytidae*) - 1 species

23. Winter Wren (*Troglodytes troglodytes*)

Family V - 8. Crows (*Corvidae*) - 5 species

24. Eurasian Jay (*Garrulus glandarius*)
25. Magpie (*Pica pica*)
26. Rook (*Corvus frugilegus*)
27. Hooded Crow (*Corvus cornix*)
28. Common Raven (*Corvus corax*)

Family V – 9. Starlings (*Sturnidae*) - 1 species

29. Common Starling (*Sturnus vulgaris*)

Family V - 10. Sparrows (*Passeridae*) - 2 species
30. House Sparrow (*Passer domesticus*)
31. Tree Sparrow (*Passer montanus*)

Family V – 11. Finches (Fringillidae) - 4 species
32. Common Chaffinch (*Fringilla coelebs*)
33. Brambling (*Fringilla montifringilla*)
34. European Goldfinch (*Carduelis carduelis*)
35. European Greenfinch (*Carduelis chloris*

4.2. Main results of target bird species surveys carried out in February 2020

In total, at least 16 individuals of eight raptor species, or Birds of Prey (Falconiformes) and three individuals of two owl species (Strigiformes), which were considered as a target species, were recorded during 2022 winter survey carried out in the Ruisi WPP Project Area. Additionally, at least 23 individuals of seven raptor species and two individuals of one owl species were recorded adjacent areas.

These eight species of the Birds of Prey which are associated in the two families (Accipitridae – six species) and (Falconidae – two species) were registered during field works:

Order Birds of Prey (*Falconiformes*)
Family Buzzards, etc (*Accipitridae*)
- Hen Harrier (*Circus pygargus*)
- Goshawk (*Accipiter gentilis*)
- Eurasian Sparrowhawk (*Accipiter nisus*)
- Common Buzzard (*Buteo buteo*)
- Long-legged Buzzard (*Buteo rufinus*)
- Rough-legged Buzzard (*Buteo lagopus*)

Family Falcons (*Falconidae*)
- Common Kestrel (*Falco tinnunculus*)
- Merlin (*Falco columbarius*)

Order Owls (*Strigiformes*)
Family Owls (*Strigidae*)
- Long-eared Owl (*Asio otus*)
- Little Owl (*Athene noctua*)

The most common raptor species were Eurasian Sparrowhawk (Accipiter nisus) – 4 individuals were recorded and Common Kestrel (Falco tinnunculus) – 3 individuals were counted. Other target species were common, but not numerous visitor to monitored area.

Eight individuals of five raptor species were counted during direct visual observations from vantage point, six individuals of four raptor species and one owl were counted during surveys on foot and two individuals of two raptor species and one owl were noted during road-car survey carried out within the limits of study area in the January - February 2022. Additionally twenty individuals of five raptor species and two individuals of two owl species were observed in adjacent areas.

More detailed data on the results of survey of target bird species presented below in the list of counted individuals of target bird species from vantage point, during surveys on foot and road-car surveys by separate days (table 1), height of flight (table 2), directions of flight (table 3), daily activity by hours (table 4) as well as in reviews on the separate target bird species.

Lists of counted raptors from vantage points by days:
January 20, 2022; from 11:15 to 17:10 (5 hours and 55 minutes);
Sparrowhawk – 1; Common Kestrel – 1;
Totals: 2 individuals, 2 species;

January 24, 2022; from 09:20 to 17:45 (8 hours and 25 minutes);
Sparrowhawk – 1; Common Kestrel – 1;
Totals: 2 individuals, 2 species;

January 29, 2022; from 09:30 to 17:40 (8 hours and 10 minutes);
Rough-legged Buzzard – 1; Merlin – 1;
Totals: 2 individuals, 2 species;

January 31, 2022; from 09:15 to 17:00 (7 hours and 45 minutes);
Northern (Hen) Harrier – 1 individual;
Totals: 1 individual, 1 species;

February 2, 2022; from 10:45 to 18:00 (7 hours and 15 minutes);
Sparrowhawk – 2;
Totals: 2 individuals, 1 species;

February 5, 2022; from 09:00 to 17:45 (8 hours and 45 minutes);
Goshawk – 1; Rough-legged Buzzard; Common Kestrel – 1;
Totals: 3 individuals, 3 species;

February 10, 2022; from 09:15 to 17:30 (8 hours and 15 minutes);
Long-legged Buzzard – 1;
Totals: 1 individual, 1 species;

February 14, 2022; from 08:40 to 18:15 (9 hours and 35 minutes);
Common Buzzard – 1; Long-legged Buzzard – 1;
Totals: 2 individuals, 2 species;

Table 1. Results of counts of target bird species conducted in Ruisi WPP Project Area in January - February 2022 during observations from vantage point, surveys on foot and road-car surveys

Bird species	Dates and numbers of individuals								
	20.01	24.01	29.01	31.01	2.02	5.02	10.02	14.02	**Total**
Northern (Hen) Harrier *Circus cyaneus*	-	1	-	1	-	-	-	-	**2**
Goshawk *Accipiter gentilis*	-	-	-	-	-	1	-	-	**1**
Sparrowhawk *Accipiter nisus*	1	1	-	-	2	-	-	-	**4**
Common Buzzard *Buteo buteo*	-	-	-	-	-	-	-	1	**1**
Long-legged Buzzard *Buteo rufinus*							1	1	**2**
Rough-legged Buzzard *Buteo lagopus*	-	-	1	-	-	1	-	-	**2**
Common Kestrel *Falco tinnunculus*	1	1	-	-	-	1	-	-	**3**
Merlin *Falco columbarius*	-	-	1	-	-	-	-	-	**1**
Total:	**2**	**3**	**2**	**1**	**2**	**3**	**1**	**2**	**16**

Table 2. Information about the height of flight of the target bird species recorded during winter 2022 survey

Height of flight	Number of individuals
0 (bird sitting on ground)	1
1 - 20	5
20 - 50	3
50 – 100	3
100 – 200	1
200+	3
Totals	**16**

Table 3. General information about the direction of flight of the target bird species recorded during winter survey

Flight directions	Number of raptors observed from vantage points
N	-
NNE	-
NE	2
ENE	-
E	2
ESE	-
SE	2
SSE	-
S	2
SSW	1
SW	3
WSW	-
W	2
WNW	-
NW	-
NNW	-
Movement without a definite direction - hunting flights, soaring	1
The bird was observed sitting on the ground, tree, stone, rock, pole, wires, building, fence, etc.	1
Totals	**16**

Table 4. Materials on the activity of the target bird species by hours

Hours	Number of individuals
before 08:00	-
08:00 - 10:00	3
10:00 - 12:00	4
12:00 - 14:00	6
14:00 - 16:00	2
16:00 – 18:00	1
Totals	**16**

4.3. Detailed review on the separate target species

1. Hen Harrier (*Circus pygargus*) - Regularly presented, but in small numbers, winter visitor to the area under consideration (picture 12). Observed in open and semi-open habitats (picture 13). Only two solitary individuals, male (on January 24) and female (on January 31), recorded within the limits of Ruisi WPP Project Area during winter 2022 survey. Besides that, three individuals – all males, were recorded in adjacent areas – in the fields west of the villages Tsveri, Sagholasheni and Doghlauri;

Picture 12. Hen Harrier (*Circus pygargus*), male; January 24, 2022

Picture 13. Hunting habitats of Hen Harrier (*Circus pygargus*) in the eastern part of monitored area; January 24, 2022

2. Goshawk (*Accipiter gentilis*) - Rare in small numbers and secretive winter visitor and transit migrant (picture 14). Always recorded by solitary individuals. Only one individual, male, was counted during field works in January - February 2020. This goshawk, flying no south-western direction at height 60-70 m was observed during survey on foot conducted on February 5, 2022 in the central part of study area. Besides that, another Goshawk, female, was recorded in adjacent area – in early morning on February 14, 2022 (08:25) at the motor road about 3.0 – 3.5 km east of locality Urbnisi;

Picture 14. Northern Goshawk (*Accipiter gentilis*), female; February 14, 2022

3. Eurasian Sparrowhawk (*Accipiter nisus*) - Widespread and common passage migrant and winter visitor, the most common wintering raptor species to the Ruisi WPP Project Area as well as to adjacent areas. Four individuals were counted during field works carried out in January - February 2022 within the limits of study area (three females and one male) and five individuals were observed in adjacent areas. Max. day-count, n – 4, was noted on February 2, when two solitary individuals, male and female (picture 15), were recorded in the central part of study area and two more were observed in adjacent areas – along southern and south-western limits of the Ruisi WPP Project Area. The hawk watched in wide variety of habitats, but more often recorded at forest edge, in open woodlands, near farms and in the vicinity of villages, where the number of wintering small passerine birds – the main prey for sparrowhawks, is especially high (pictures 16 and 17). Always observed by solitary individuals flying at height 20 – 50 m;

Picture 15. Eurasian Sparrowhawk (*Accipiter nisus*), female February 2, 2022

Picture 16. Hunting habitats of Eurasian Sparrowhawk (*Accipiter nisus*) in the south-eastern corner of the Ruisi WPP Project Area; January 24, 2022

Picture 17. Hunting habitats of Eurasian Sparrowhawk (*Accipiter nisus*) in north-western part of the Ruisi WPP Project Area; February 5, 2022

4. Common Buzzard (*Buteo buteo*) - Common, but in general not numerous, wintering raptor species (picture 18), but number of wintering individuals greatly varied due of the concrete weather conditions. Recorded in all parts of the Ruisi WPP Project Area as well as to adjacent areas. Occurs in open and semi-open habitats with sparse vegetation, more often in cultivated fields (picture 19). Only one individual was recorded during winter survey within the limits of Project Area, this buzzard was observed in cultivated field between Breti and Ruisi villages on February 14, 2022. Besides that, three individuals were watched in adjacent areas;

Picture 18. Common Buzzard (*Buteo buteo*); February 14, 2022

Picture 19. Hunting habitats of Common Buzzard (*Buteo buteo*) in the central part of study area; February 14, 2022

5. Long-legged Buzzard (*Buteo rufinus*) - Widespread, regular and common, but not numerous, winterer to the area under consideration. Only two solitary individuals were recorded during winter survey – on February 10 and February 14, 2022

Picture 20. Hunting habitats of Long-legged Buzzard (*Buteo rufinus*) in the northern part of study area; February 10, 2022

Picture 21. Hunting habitats of Long-legged Buzzard (*Buteo rufinus*) in the central part of study area; February 14, 2022

6. Rough-legged Buzzard (*Buteo lagopus*) - More-or-less common in small numbers winterer (picture 22) to the Ruisi WPP Project Area as well as to adjacent areas. Observed in open habitats of the monitored area - in fields, pastures, gentle tree-less slopes, etc. (picture 23). Solitary individuals were counted only two times during the field works carried out in January – February 2022. Specifically, rough-legged buzzards were observed from the vantage point soaring and hunting on small rodents in fields in the central parts of study area on January 29 and February 5, 2022;

Picture 22. Rough-legged Buzzard (*Buteo lagopus*); February 5, 2022

Picture 23. Hunting habitats of Rough-legged Buzzard (*Buteo lagopus*); February 5, 2022

7. Common Kestrel (*Falco tinnunculus*) - Widespread and common, but in general not numerous, winterer. Occurs in open habitats in all parts of monitored area, but more often watched hunting on small rodents in open habitats (pictures 24 and 25). Three solitary individuals were recorded during winter survey – on January 20, January 24 and February 5, 2022;

Picture 24. Typical hunting habitats of Common Kestrel in the eastern part of monitored area; January 24, 2022

Picture 25. Typical hunting habitats of Common Kestrel in the central part of monitored area; February 5, 2022

8. Merlin (*Falco columbarius*) - Very rare, irregular, in small numbers, or occasional, passage and winter visitor. Only one individual was recorded during winter 2022 survey – on January 29. This falcon was observed flying across south-eastern part of monitored area to eastern direction at height about 20 meters. Additionally, single was recorded on January 20, 2022 in adjacent area – at the left side of Mtkvari River flood-land near town of Kareli;

9. Long-eared Owl (*Asio otus*) - Common, but not numerous, year-round resident with local seasonal movements. More widespread and common in adjacent areas, especially in the Mtkvari River flood-land. Typically recorded in, or near, artificial pine forests. No data on total numbers. In winter, usually from the middle of December to the first decade of March, numbers of Long-eared Owl is increasing owing to arrival of birds from the more northern parts of breeding range. Two solitary individuals were observed during winter monitoring – one was seen for several minutes sitting on dry branch of pine in the artificial pine forest in the south-eastern part of study area on January 24, 2022 (picture 26) and another was observed flying to northern direction at height 3 – 5 m in the north-western part of the Project Area in field between Saqasheti and Breti villages on February 2, 2022;

Picture 26. Wintering habitats of Long-eared Owl (*Asio otus*)

10. Little Owl (*Athene noctua*) - Widespread and common year-round resident (picture 27). Occurs in various habitats with presence of various outbuildings, abandoned and dilapidated buildings, ruins, etc. Two times solitary individuals were seen at in the ruins near Breti village. Under the roof of a dilapidated outbuilding in the central part of the Ruisi WPP Project Area, an overnight stay of Little Owl was discovered. Numerous remains of prey (small rodents) and pellets were collected here (picture 28). Besides that, single was recorded on January 31, 2022 in adjacent area – at the right bank of the Mtkvari River near town of Kareli;

Picture 27. Little Owl (*Athene noctua*); January 31, 2022

Picture 28. Pellets and prey remains in the overnight stay of Little Owl (*Athene noctua*); January 31, 2022

11. Feral Pigeon - *Columba livia f. domesticus* - Common year-round resident. Breeds in some human settlements situated in the area under consideration. Small flocks, consisting up to 10 individuals were recorded in the Ruisi and Breti villages on January 24, February 5 and February 10, 2022;

12. Great Spotted Woodpecker (*Dendrocopos major*) - Common, but not numerous, year-round resident with seasonal movements. Two solitary individuals were recorded during winter monitoring – one was observed in garden in the Ruisi village on January 29 and another was watched on February 2 in artificial pine forest in the south-eastern corner of Project Area (picture 29);

Picture 29. Habitats of Great Spotted Woodpecker (*Dendrocopos major*) in the eastern part of monitored area; January 31, 2022

13. Calandra Lark (*Melanocorypha calandra*) - Widespread and common year-round resident, probably partially migrant or migratory breeder, passage visitor and wintering bird species. Occurs in various open habitats (pictures 30 and 31). The numbers of wintering flocks as well as numbers of individuals in separate flocks is subject to significant fluctuations. So, only at least 15 individuals in three small flocks were observed feeding in fields on February 14, 2022. More widespread and numerous in adjacent areas;

14. Crested Lark (*Galerida cristata*) - Widespread and common year-round resident, or partially migrant, passage and winter visitor to wide variety of open habitats of the Ruisi WPP Project Area as well as to adjacent areas (pictures 30 and 31). The numbers considerably fluctuates due to the weather conditions. Several small flocks, consisting 3 - 15 individuals in each, and solitary individuals totally ca.120, were watched feeding in fields. Most of records were noted on February 10 and February 14, 2022;

Picture 30. Wintering habitats of Calandra Lark (*Melanocorypha calandra*) and Crested Lark (*Galerida cristata*) in the central part of the Ruisi WPP Project Area; January 31, 2022

Picture 31. Wintering habitats of Calandra Lark (*Melanocorypha calandra*) and Crested Lark (*Galerida cristata*) in the northern part of the Ruisi WPP Project Area; January 31, 2022

15. Water Pipit (*Anthus spinoletta*) - Irregular and not numerous winter visitor. Only two solitary individuals were recorded during survey in the south-western part of study area – on February 14, 2022 in fields between motor-road and WTG No 10 and WTG No 15. Besides that, four individuals were observed in adjacent area – on the left bank of the Mtkvari River near Bebnisi village;

16. White (Pied) Wagtail (*Motacilla alba*) - Widespread and common migratory breeder and passage visitor, but irregular winterer whose numbers vary greatly both over the years as well as during one winter. In the winter of 2022, only three solitary individuals were recorded in the south-western corner of study area - on February 10 and February 14, 2022. More common in adjacent areas – in the flood-land of Mtkvari River;

17. European Robin (*Erithacus rubecula*) - Rare winter visitor to study area (picture 32). More common in adjacent areas. Two solitary individuals were recorded on February 14, 2022 in Breti village;

Picture 32. European Robin (*Erithacus rubecula*); February 14, 2022

18. Common Blackbird (*Turdus merula*) - Widespread and year-round resident. Recorded in wide variety of habitats in all parts of Project Area. About 25 individuals were recorded during winter survey in all parts of study area. Most of records were near artificial pine forests and in gardens in all villages;

19. Fieldfare (*Turdus pilaris*) - Common, but irregular, winter visitor (picture 33). Absent in some winters. Only two small flocks, consisting 10 – 15 individuals in each, were watched during winter survey. Flocks of fieldfares were observed feeding in gardens and in fields with scattered trees in the central and south-western parts of monitored area on January 20 and February 10 (picture 34);

Picture 33. Fieldfare (*Turdus pilaris*); January 20, 2022

Picture 34. Wintering habitats of Fieldfare (*Turdus pilaris*); February 10, 2022

20. Long-tailed Tit (*Aegithalos caudatus*) - Widespread and common, but not numerous, year-round resident with local seasonal movements. Four times small flocks consisting from four to seven individuals in each were observed in artificial woodlands, dense low trees along southern limit of study area and in gardens in the villages (picture 36);

21. Blue Tit (*Parus caeruleus*) - Widespread and common, but in general not numerous, year-round visitor and scarce breeder to adjacent areas (picture 35). Occurs in all parts of monitored area except tree-less habitats – cultivated fields in the central part of monitored area. Several times solitary individuals and small groups, totally ca.40, were observed in mixed flocks together with Long-tailed Tit (Aegithalos caudatus) and Great Tit (Parus major) in woodlands and gardens (picture 36);

Picture 35. Blue Tit (*Parus caeruleus*); January 31, 2022

Picture 36. Wintering habitats of Long-tailed Tit (*Aegithalos caudatus*), Great Tit (*Parus major*) and Blue Tit (*Parus caeruleus*); January 31, 2022

22. Great Tit (*Parus major*) - Common, but not numerous, year-round resident with local seasonal movements. Inhabits various habitats, but more often observed in artificial pine forests in south-eastern corner of study area and in gardens in the villages located in the western part of study area (picture 36). Small flocks, sometimes mixed, and solitary individuals, totally ca. 70, were observed during winter 2022 surveys. More common and numerous in adjacent areas;

23. Winter Wren (*Troglodytes troglodytes*) - Widespread and common year-round resident in various habitats (pictures 37 and 38). Several solitary individuals were noted in during winter survey;

Picture 37. Winter Wren (*Troglodytes troglodytes*); January 20, 2022

Picture 38. Wintering habitats of Winter Wren (*Troglodytes troglodytes*); January 20, 2022

24. Eurasian Jay (*Garrulus glandarius*) - Common, but not numerous, year-round resident. More common in adjacent area. Seven records of solitary individuals were noted during winter survey, mostly in or near artificial pine forest in the south-eastern corner of monitored area and in gardens in the Breti and Ruisi villages;

25. Magpie (*Pica pica*) - Widespread and common year-round resident to all parts of the Ruisi WPP Project Area. Recorded in wide variety of habitats, but more often in semi-open habitats, in pastures and cultivated fields, in and around villages, along roads, etc. (picture 38). Solitary individuals and small flocks, totally ca.70 individuals, regularly were observed during winter 2022 survey in all parts of study area as well as in adjacent areas;

Picture 38. Typical habitats of Magpie (*Pica pica*) and old nest in the central part of study area; February 10, 2022

26. Rook (*Corvus frugilegus*) - More-or-less common but irregular winter visitor, widespread and common in some winters. More often observed by flocks consisting from 20 up to 50 individuals, rarely more. Inhabits fields, pastures, roadsides, etc. (picture 39 and 40). Three small flocks, about 15 – 20 individuals in each, were observed feeding in fields on January 31, February 10 and February 14. More common and numerous in adjacent areas;

Picture 39. Habitats of Rook (*Corvus frugilegus*) in the central part of study area; January 31, 2022

Picture 40. Typical habitats of Rook (*Corvus frugilegus*) in the western part of study area; February 14, 2022

27. Hooded Crow (*Corvus cornix*) - Widespread and numerous year-round resident (picture 41). Recorded in wide variety of habitats in all parts of study area with a highest density in semi-open habitats, cultivated fields, pastures, near villages and farms, along roads (pictures 42 and 43). Not counted;

Picture 41. Hooded Crows (*Corvus cornix*); February 14, 2022

Picture 42. Habitats of Hooded Crows (*Corvus cornix*) in the western part of study area; February 10, 2022

Picture 43. Habitats of Hooded Crows (*Corvus cornix*) in the centre al part of study area; February 14, 2022

28. Common Raven (*Corvus corax*) - Widespread and common, but in general not numerous, year-round visitor without breeding. About ten solitary individuals, two pairs and two small flocks, consisting three and four 4 individuals in each, were watched during winter survey in all parts of monitored area;

29. Common Starling (*Sturnus vulgaris*) - Widespread and common winter and passage visitor to area under consideration, but number of flocks as well as total number of individuals in separate flocks greatly fluctuated due of weather conditions. Observed by flocks consisting from 10 up to 20 individuals, rarely more. Presented in wide variety of habitats. Two flocks - around 10 - 15 individuals in each, were recorded on February 14, 2022 in south-western part of monitored area. More widespread and numerous in adjacent areas;

30. House Sparrow (*Passer domesticus*) - Widespread and quite common year-round resident. Recorded in all villages. Not counted;

31. Tree Sparrow (*Passer montanus*) - Widespread and common year-round resident to all parts of study area. |More often observed in mixed flocks together with house sparrows, rarely with other small passerine birds. Several flocks, totally ca.150 individuals, were recorded in all parts of study area;

32. Common Chaffinch (*Fringilla coelebs*) - Widespread and common year-round resident with local / regional seasonal movements or, partial migrant, passage and winter visitor to wide variety of habitats. More often recorded in and near woodlands, gardens and tree plantations along roads between villages (pictures 44, 45, 46 and 47). Common Chaffinch should be classified as one of the numerous wintering bird species to monitored area, dominant, or sub-dominant, bird species. Not counted;

33. Brambling (*Fringilla montifringilla*) - Widespread and common winter visitor throughout the whole area under consideration (picture 48). Number of wintering flocks and individuals in each flock greatly fluctuated due to concrete weather conditions. Observed in various open and semi-open habitats. Usually recorded in fields with scattered and grouped low trees and bushes, farmland, cultivated fields, gardens, villages, etc. (pictures 44, 45, 46 and 47). The wintering flocks sometimes are associated with other seed-eating bird species, especially with European Goldfinch (*Carduelis carduelis*) and Common Chaffinch (*Fringilla coelebs*), rarely with European Greenfinch (*Carduelis chloris*) and others small passerine birds. Flocks consisting from 10 to 30 individuals in each, totally ca. 250, were observed during winter 2022 survey - on January 20, January 24, January 29, February 5 and February 10;

Picture 48. Brambling (*Fringilla montifringilla*)

34. European Goldfinch (*Carduelis carduelis*) - Widespread and quite common year-round resident with local seasonal movements, or, probably, partial migrating breeder, passage visitor and winterer. Commonly observed in dry open and semi-open habitats with sparse vegetation –in cultivated fields, pastures, gardens, around villages, etc. (picture 44, 45, 46 and 47). Numerous flocks, consisting from 5 to 20 individuals in each, totally ca.300, regularly were presented during winter 2022 monitoring in all parts of the Ruisi WPP Project Area;

35. European Greenfinch (*Carduelis chloris*) - Widespread and more-or-less common migratory breeder, or, probably, partial migrant to some parts of study area. Observed in wide variety of habitats in south-eastern part and along western limits of study area. The most preferred habitats are artificial pine forest edge, farmland hedges and gardens with relatively thick vegetation (pictures 44, 45, 46 and 47). Small flocks and solitary individuals, totally at least 50 individuals, several times were watched in gardens in Ruisi, Sasireti, Breti and Bebnisi villages;

Pictures 44, 45, 46 and 47. Typical wintering habitats of Common Chaffinch (*Fringilla coelebs*), Brambling (*Fringilla montifringilla*), European Goldfinch (*Carduelis carduelis*) and European Greenfinch (*Carduelis chloris*); February 10, 2022

August 16, 2022
REPORT
TO JSC Wind Power

RUISI WIND POWER PLANT PROJECT

Ornithological Monitoring Report

Quarterly Report

for the Summer 2022 Period – June/July 2022

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1. Introduction

This Report has been prepared for 206 MW Ruisi Wind Power Plant (WPP) planned in Shida Kartli Region of Georgia. The Monitoring comprised the area selected for the WPP and its environs. The report is based on outcomes of the bird monitoring, and describes its schedule, methodology and detailed findings. The presented report covers the breeding period of birds from 3 June to 15 July 2022.

2. Objectives of Ornithological Monitoring

The main objective of the survey was to collect baseline data on breeding birds within the limits of Ruisi WPP Project Area and in adjacent areas.

The specific objective of the study was to obtain information on the composition of nesting bird species, their status of presence, territorial distribution, habitat selection, numbers of presented individuals, or densities, of solitary birds species, flight activity during nesting in the study area and some other aspects of summer Avifauna in the area under consideration (Picture 2-1).

Picture 2-1. Study area - 206 MW Ruisi Wind Power Plant

3. Survey Methodology

Field works in Summer 2022 were carried out by professional zoologist - Dr. Alexander Abuladze from the Institute of Zoology, Ilia State University in co-operation with assistant and assistant/drivers. Fieldwork were carried out in area selected for the planned Ruisi Wind Power Plant (Ruisi WPP) Project. The Project Area situated in the eastern part of Georgia, in Shida Kartli Region, approximately 7 km to the north-west of Gori City (Picture 2-1).

The boundary coordinates of area under consideration are as follows:

	X	Y		X	Y
1	408258.90	4652498.42	**3**	418087.10	4650817.44
2	408543.97	4662506.17	**4**	418125.98	4662196.82

During the survey of breeding birds all parts of Ruisi WPP Project Area and the most important, from biodiversity point of view, sites in adjacent territories were visited and surveyed.

3.1 Schedule of field works in Summer 2022 at the Ruisi WPP Project area and in adjacent areas

Field works carried out during the Summer 2022 Ornithological Monitoring for the Ruisi WPP Project Area comprised 21 calendar/ working days. The total duration of fieldwork conducted in summer 2022 was 255 hours and 20 minutes, which is quite sufficient for ornithological monitoring work of this kind for a relatively small area during summer season.

Specific dates and duration of observations during each day are as follows:

- June 3/4, 2022; from 22:10 to 02:30 (4 hours and 20 minutes) – night survey;
- June 5, 2022; from 07:40 to 19:50 (12 hours and 10 minutes);
- June 7, 2022; from 07:30 to 21:15 (13 hours and 45 minutes);
- June 9, 2022; from 08:00 to 19:45 (11 hours and 45 minutes);
- June 11, 2022; from 06:50 to 20:30 (13 hours and 40 minutes);
- June 13, 2022; from 08:15 to 19:30 (11 hours and 15 minutes);
- June 15, 2022; from 07:20 to 19:50 (12 hours and 30 minutes);
- June 18, 2022; from 06:30 to 20:45 (14 hours and 15 minutes);

- June 20, 2022; from 07:45 to 20:00 (12 hours and 15 minutes);
- June 22, 2022; from 07:10 to 21:15 (14 hours and 5 minutes);
- June 25, 2022; from 08:40 to 20:50 (12 hours and 10 minutes);
- June 27/28, 2022; from 20:45 to 03:15 (6 hours and 30 minutes) – night survey;
- June 29, 2022; from 07:30 to 19:50 (12 hours and 20 minutes);
- July 1, 2022; from 08:10 to 20:15 (12 hours and 5 minutes);
- July 3, 2022; from 07:00 to 21:10 (14 hours and 10 minutes);
- July 5, 2022; from 06:00 to 20:40 (14 hours and 40 minutes);
- July 7, 2022; from 08:15 to 19:50 (11 hours and 35 minutes);
- July 9, 2022; from 07:50 to 20:30 (12 hours and 40 minutes);
- July 10/11, 2022; from 21:30 to 03:45 (6 hours and 15 minutes) – night survey;
- July 12, 2022; from 07:30 to 20:00 (12 hours and 30 minutes);
- July 14/15, 2022; from 22:30 (July 14) to 04:45 (July 15), 2022; (6 hours and 15 minutes) – night survey;
- July 15, 2022; from 08:20 to 16:30 (8 hours and 10 minutes);

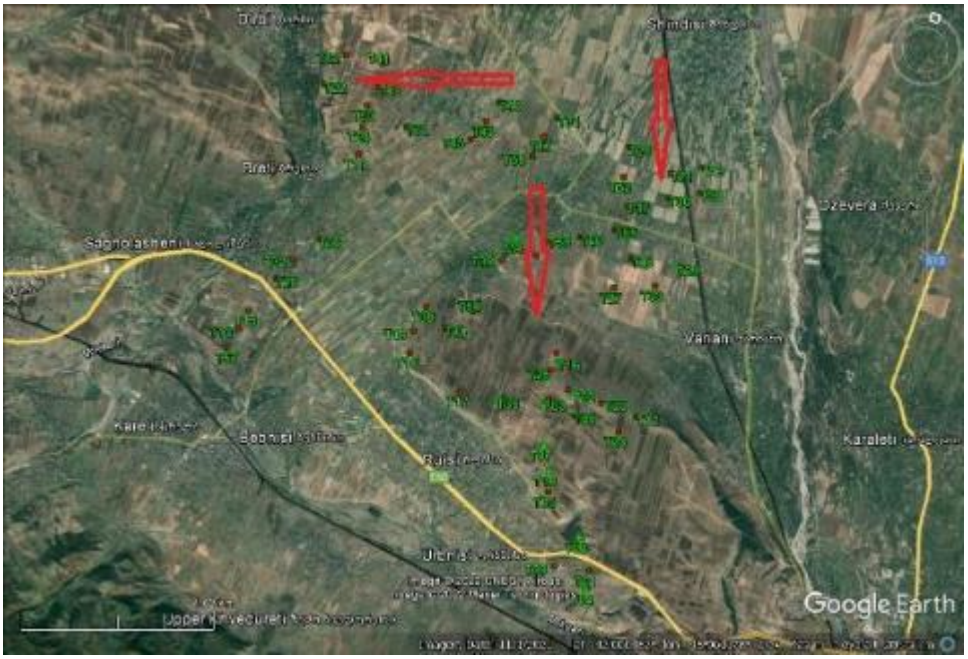
3.2 Survey Methodology

The methods used during field work in the summer of 2022 were similar to those used in previous seasons. Their descriptions are given in previously submitted reports - autumn 2021 and winter 2022. Specifically, these included:

3.2.1 Vantage Point Survey, or direct visual observations from vantage point located at high point of relief with optimal conditions for direct visual observations

The Vantage Point (VP) surveys that were carried out by two or three surveyors (the expert together with one or two assistant(s)) experienced in the identification of birds of Georgia. The total duration of Vantage Point surveys was 118 hours and 25 minutes.

Three Vantage Points were located in the open habitats in various parts of the Ruisi WPP Project Area, in the more-or-less high points (Picture 3-1)



Picture 3-1. Location of the Vantage Points during summer 2022 survey

Information on the duration of visual observations by days for each vantage point:

VP 1 - Duration of visual observations – 45 hours and 25 minutes

- June 5, 2022; from 09:40 to 14:00 (4 hours and 20 minutes);
- June 7, 2022; from 07:30 to 12:15 (4 hours and 45 minutes);
- June 9, 2022; from 09:20 to 14:45 (5 hours and 25 minutes);
- 19:50 (3 hours and 5 minutes), totally 9 hours and 35 minutes;
- June 25, 2022; from 08:40 to 12:50 (4 hours and 10 minutes) and from 16:15 to 19:00 (2 hours and 45 minutes), totally 6 hours and 55 minutes;
- July 3, 2022; from 08:00 to 12:45 (4 hours and 45 minutes) and from 15:50 to 19:20 (3 hours and 30 minutes), otally 8 hours and 15 minutes;
- July 9, 2022; from 07:50 to 12:30 (4 hours and 40 minutes) and from 16:45 to 19:15 (2 hours and 30 minutes), totally 7 hours and 10 minutes;

VP 2 - Duration of visual observations – 39 hours and 50 minutes

- June 11, 2022; from 10:15 to 18:00 (7 hours and 45 minutes);
- June 13, 2022; from 08:15 to 12:45 (4 hours and 30 minutes) and from 16:15 to 19:30 (3 hours and 15 minutes), totally 7 hours and 45 minutes;
- June 15, 2022; from 09:30 to 14:50 (5 hours and 20 minutes);
- June 20, 2022; from 07:45 to 12:50 (5 hours and 5 minutes);
- July 1, 2022; from 08:10 to 12:20 (4 hours and 10 minutes) and from 17:15 to 20:00 (2 hours and 45 minutes), totally 6 hours and 55 minutes;
- July 5, 2022; from 07:20 to 12:30 (5 hours and 10 minutes) and from 18:10 to 20:00 (1 hour and 50 minutes), totally 7 hours;

VP 3 - Duration of visual observations – 36 hours and 10 minutes

- June 18, 2022; from 08:10 to 12:40 (4 hours and 30 minutes) and from 16:40 to 20:00 (3 hours and 20 minutes), totally 7 hours and 50 minutes;
- June 29, 2022; from 07:30 to 14:15 (6 hours and 45 minutes);
- July 7, 2022; from 08:15 to 15:00 (6 hours and 45 minutes);
- July 12, 2022; from 07:30 to 12:50 (5 hours and 20 minutes) and from 16:20 to 19:40 (3 hours and 20 minutes), totally 8 hours and 40 minutes;
- July 15, 2022; from 08:20 to 14:30 (6 hours and 10 minutes);

3.2.2 Survey on foot

Survey on foot across all parts/sections of Ruisi WPP Project Area as well as in adjacent areas carried out by two or, in some cases, by three surveyors – expert and assistant/s (pictures 3-2 and 3-3).

Surveys on foot conducted throughout the daylight hours, usually in favorable weather conditions, optimal for visual observations.

The total duration of surveys on foot with stops for visual observations from high points of terrain was 83 hours and 15 minutes.

The minimum duration of daily surveys on foot were: 1 hour and 30 minutes (on July 15, 2022), 3 hours and 30 minutes (on July 12, 2022) and 3 hours and 45 minutes (on July 3, 2022). The maximum duration of daily surveys on foot were: 6 hours and 40 minutes (on June 5, 2022) and 6 hours and 10 minutes (on June 18, 2022).

Picture 3-2. June 11, 2022

Pictiure 3-3. July 15, 2022

The duration of surveys on foot for separate days was as follows:

- June 5, 2022; from 08:20 to 09:40 (1 hour and 20 minutes) and from 14:00 to 19:20 (5 hours and 20 minutes), totally 6 hours and 40 minutes;
- June 7, 2022; from 12:15 to 15:15 (2 hours) and from 17:40 to 21:15 (3 hours and 35 minutes), totally 5 hours and 35 minutes;
- June 9, 2022; from 08:30 to 09:20 (50 minutes) and from 14:45 to 18:45 (4 hours), totally 4 hours and 50 minutes;
- June 11, 2022; from 08:00 to 10:15 (2 hours and 15 minutes) and from 18:00 to 20:30 (2 hours and 30 minutes), totally 4 hours and 45 minutes;
- June 13, 2022; from 12:45 to 18:15 (5 hours and 30 minutes);
- June 15, 2022; from 07:20 to 09:30 (2 hours and 10 minutes) and from 14:50 to 18:15 (3 hours and 25 minutes), 4 hours and 35 minutes;
- June 18, 2022; from 12:40 to 18:50 (6 hour and 10 minutes);
- June 20, 2022; from 14:45 to 20:00 (5 hours and 15 minutes);
- June 22, 2022; from 14:10 to 16:45 (2 hours and 35 minutes) and from 19:50 to 21:15 (1 hour and 25 minutes), totally 3 hours and 50 minutes;
- June 25, 2022; from 12:50 to 15:30 (2 hours and 40 minutes) and from 19:00 to 20:50 (1 hour and 50 minutes), totally 4 hours and 30 minutes;
- June 29, 2022; from 14:15 to 18:45 (4 hours and 30 minutes);
- July 1, 2022; from 13:00 to 17:15 (4 hours and 15 minutes);
- July 3, 2022; from 07:20 to 08:00 (40 minutes) and from 12:45 to 15:50 (3 hours and 5 minutes), totally 3 hours and 45 minutes;
- July 5, 2022; 12:30 to 18:10 (5 hour and 40 minutes);
- July 7, 2022; from 15:00 to 19:10 (4 hours and 10 minutes);
- July 9, 2022; from 12:30 to 16:45 (4 hours and 15 minutes);
- July 12, 2022; 12:50 to 16:20 (3 hours and 30 minutes);
- July 15, 2022; from 14:30 to 16:00 (1 hour and 30 minutes);

3.2.3. Road-car survey

Road-car survey in open and semi-open habitats with field glasses from a moving car around and across monitored area - Ruisi WPP Project Area and in adjacent areas.

Road-car surveys, 24 hours and 50 minutes in total, were carried out with a series of frequent short stops from 5 minutes to 30 minutes in high points with good conditions for visual observations. The minimum duration of road-car daily surveys were: 20 minutes (on July 12, 2022) and 30 minutes (on June 22, 2022 and July 15, 2022). The maximum duration of road-car daily surveys were: 3 hours and 35 minutes (on June 18, 2022) and 2 hours and 25 minutes (on June 7, 2022). 4 x 4 car "Nissan xTerra" used for road-car surveys (pictures 3-4 and 3-5).

The duration of road-car surveys during field works conducted in summer 2022 for separate days was as follows:

- June 5, 2022; from 07:40 to 08:20 (40 minutes) and from 19:20 to 19:50 (30 minutes), totally 1 hour and 10 minutes;
- June 7, 2022; from 15:15 to 17:40 (2 hours and 25 minutes);
- June 9, 2022; from 08:00 to 08:30 (30 minutes) and from 18:45 to 19:45 (1 hour), totally 1 hour and 30 minutes;
- June 11, 2022; from 06:50 to 08:00 (1 hour and 10 minutes);
- June 13, 2022; from 18:15 to 19:30 (1 hour and 15 minutes);
- June 15, 2022; from 18:15 to 19:50 (1 hours and 35 minutes);
- June 18, 2022; from 06:30 to 08:10 (1 hour and 40 minutes) from 18:50 to 20:45 (1 hour and 55 minutes), totally 3 hours and 35 minutes;
- June 20, 2022; from 12:50 to 14:45 (2 hours and 5 minutes);
- June 22, 2022; from 07:10 to 07:40 (30 minutes);
- June 25, 2022; from 15:30 to 16:50 (1 hour and 20 minutes);
- June 29, 2022; from 18:45 to 19:50 (1 hour and 5 minutes);
- July 1, 2022; from 12:20 to 13:00 (40 minutes) and from 20:00 to 20:15 (15 minutes), totally 55 minutes;
- July 3, 2022; from 07:00 to 07:20 (20 minutes) and from 19:20 to 21:10 (1 hour and 50 minutes), totally 2 hours and 10 minutes;
- July 5, 2022; from 06:00 to 07:20 (1 hour and 20 minutes);
- July 7, 2022; from 19:10 to 19:50 (40 minutes);
- July 9, 2022; from 19:15 to 20:30 (1 hour and 15 minutes);
- July 12, 2022; from 19:40 to 20:00 (20 minutes);
- July 15, 2022; from 16:00 to 16:30 (30 minutes);

Picture 3-4 Road-car survey in the central part of study area; June 29, 2022

Picture 3-5 July 3, 2022

3.2.4. Using of Playbacks for nocturnal birds survey

The monitoring of nocturnal birds, or species with night activity was conducted using of playbacks (picture 3-6). Nocturnal bird surveys were done in good weather conditions on calm nights. A total of 23 hours and 20 minutes of night surveys were carried out in 2022 during breeding of owls:

- June 3/4, 2022; from 22:10 to 02:30 (4 hours and 20 minutes);
- June 27/28, 2022; from 20:45 (June 27) to 03:15 (June 28); (6 hours and 30 minutes);
- July 10/11, 2022; from 21:30 (July 10) to 03:45 (July 15); (6 hours and 15 minutes);
- July 14/15, 2022; from 22:30 (July 14) to 04:45 (July 15); (6 hours and 15 minutes);

Picture 3-6. Nocturnal bird survey; June 27, 2022

3.2.5 Equipment Used

Various binoculars, telescopes, photo cameras photo cameras, lenses and some other equipment used during field works carried out in summer 2022:

- Identification of birds was through various binoculars “Nikon Aculon 10 x 50”, “Nikon Action 10 x 50”and in some cases during road-car surveys through “Pentax 8 x 25”. Besides that, binocular-cam “Trust 8 x 42” and telescopes - “Bushnell” 20x-60x60mm Coated Optics Adjustable Focus Spotting Scope, telescope 15-45X65 NITRO TM Spotting Scope and “Sibir20x-50x” were used during direct visual observations from vantage point.
- Various photo cameras and lenses used during field works conducted in Summer 2022: photo cameras “Nikon D5600”, “Nikon COOLPIX P900”, “Nikon P610”, “Canon PowerShot A2400 IS”, lens “AF Zoom-NIKKOR 70-300mm f/4-5.6G” and lens “Sigma” 150-600mm F5-6.3 DG OS HSM.
- The rangefinders - optical rangefinder and laser rangefinder - were used to determine the flight height of birds, especially at high altitudes exceeding 100 m. If the flight altitude of individual individuals in migratory flocks was determined, then attention was focused on the extreme heights - minimum and maximum. The disadvantage of using rangefinders is that they provide accurate data when the bird is directly at its zenith. Low heights usually were determined visually. The following rangefinders were used: Optical Rangefinder “Newcon LRM 1200 - 7x25”, Laser Rangefinder "Vortex Ranger 1800", Laser Rangefinder “Leupold RX-1000”.

The following additional equipment was use during field works: various tripods for optical equipment, GPS receiver “Garmin etrex” with entered coordinates of counting points, Walkie Talkie Radio 2 Two Way PMR 446 Midland G5 XT Long Range, camouflage tent used during observations from vantage point, survey data forms, compass, personal field equipment - warm clothes and shoes, set of maps with drawn points, various bird guides.

4 Main Results of Summer 2022 Ornithological Monitoring

As might be expected, the summer Avifauna, or the Avifauna of breeding bird species recorded within the limits of the Ruisi WPP Project Area turned out to be poor both in qualitative and quantitative terms.

In total, during 21 calendar/working days between June 3, 2022 and July 15, 2022, at least 64 bird species were recorded within the limits of the Ruisi WPP Project Area and in adjacent areas. Among these 64 species, 20 species were non-passerines and other 44 bird species were passerines.

These 64 bird species are associated in the ten systematic orders and form 14-15% of the bird species number regularly presented in the Avifauna of Georgia and around 1/4 of the bird species recorded in country during breeding seasons.

The bird species accounts, taxonomic sequence, common (English) and scientific (Latin) names presented in this report are based on the latest accepted ornithological systematic and nomenclature.

4.1. Systematic List of the bird species recorded during field works carried out in Ruisi WPP Project Area in June - July 2022

The following (one or more) categories selected for classification of the status of bird species, which occurred within the limits of study area (keys to the List):

Status of presence:

- YR-R = year-round resident, breeding species, present throughout of all seasons of year;
- YR-V = year-round visitor, non-breeding bird, present throughout of all seasons of year;
- SB = summer breeder or breeding species, present in breeding season and absent during non-breeding period;
- SV = summer visitor; non-breeder, present in spring and summer;
- PM - passage migrant (passage visitor) - bird on regular seasonal passage, present
- WV - winter visitor, non-breeding, present in late autumn, winter and early spring;
- primarily in autumn and spring;
- OV - occasional visitor (or vagrant species) - recorded only several times; unexpected because normal distribution range is very distant from Project Area.
- ND = Not defined; found but its status not known yet.
- FB = Former breeder; breeding in the past; breeding has not been confirmed more than last 10 years.

Conservation Status – IUCN Red List Categories (first symbol)/ Georgia red List Categories (second symbol):

- **CR = Critically Endangered**
- **EN = Endangered**
- **VU = Vulnerable**
- **NT = Near Threatened**
- **LC = Least Concern**

The systematic list of the bird species recorded during field works carried out in Ruisi WPP Project Area in June - July 2022 is as follows:

A. NON-PASSERINES – 20 species

Order I. Birds of Prey (*Falconiformes*) – 7 species

Family I – 1. Buzzards, etc (*Accipitridae*) - 6 species

1. Short-toed Snake-eagle (*Circaetus gallicus*)
   Status of presence PM / Conservation Status: LC
2. Eurasian Sparrowhawk (*Accipiter nisus*)
   Status of presence SV, PM, WV / Conservation Status: LC
3. Common Buzzard (*Buteo buteo*)
   Status of presence PM, YR-V, WV / Conservation Status: LC
4. Long-legged Buzzard (*Buteo rufinus*)
   Status of presence PM YR-V LC / Conservation Status: VU
5. Western Marsh Harrier (*Circus aeruginosus*)
   Status of presence PM / Conservation Status: LC
6. Montagu's Harrier (*Circus pygargus*)
   Status of presence SV, PM / Conservation Status: LC

Family I/2. Falcons (*Falconidae*) - 1 species

7. Common Kestrel (*Falco tinnunculus*)
   Status of presence PM, SV / Conservation Status: LC

Order II. *GALLIFORMES* – 1 species

Family II/1. Pheasants, Quals – 1 species

8. Common Quail (*Coturnix coturnix*)
   Status of presence PM, SB/ Conservation Status: LC

ORDER III. *COLUMBIFORMES* - 3 species

Family III/1. Pigeons and Doves (*Columbidae*) - 4 species

9. Feral Pigeon (*Columba livia f. domesticus*)

Status of presence YR-V / Conservation Status: LC

10. Common Wood Pigeon (*Columba palumbus*)
    Status of presence PM / Conservation Status: LC
11. Eurasian Collared Dove (*Streptopelia decaocto*)
    Status of presence YR-R or SB? / Conservation Status: LC

ORDER IV. *CUCULIFORMES* - 1 species

Family IV/1. Cuckoos (*Cuculidae*) - 1 species

12. Common Cuckoo (*Cuculus canorus*)
    Status of presence SB, PM/ Conservation Status: LC

ORDER V. *STRIGIFORMES* - 2 species

Family V/1. Owls (*Strigidae*) - 2 species

13. Eurasian Scops-owl (*Otus scops*)
    Status of presence SB, PM / Conservation Status:LC
14. Little Owl (*Athene noctua*)
    Status of presence YR-R / Conservation Status:LC

ORDER VI. *CAPRIMULGIFORMES*- 1 species

Family VI/1. Nightjars (*Caprimulgidae*)

15. Eurasian Nightjar (*Caprimulgus europaeus*)
    Status of presence SB, PM / Conservation Status: LC

ORDER VII. *APODIFORMES* - 1 species

Family VII/1. Swifts (*Apodidae*) - 1 species

16. Common Swift (*Apus apus*)
    Status of presence SV, PM / Conservation Status: LC

ORDER VIII. *CORACIIFORMES* - 3 species

Family VIII/1. Bee-eaters (*Meropidae*) - 1 species

17. European Bee-eater (*Merops apiaster*)
    Status of presence SV, PM / Conservation Status: LC

Family VIII/2. Rollers (*Coraciidae*) - 1 species

18. European Roller (*Coracias garrulous*)
    Status of presenceSV, PM / Conservation Status: LC

Family VIII/3. Hoopoes (*Upupidae*) - 1 species

19. Eurasian Hoopoe (*Upupa epops*)
    Status of presence SB, PM / Conservation Status: LC

ORDER IX. *PICIFORMES* - 2 species

Family IX/1. Woodpeckers (*Picidae*) - 2 species

20. Great Spotted Woodpecker (*Dendrocopos major*)
    Status of presence YR-R / Conservation Status: LC

B. PASSERINES

Order X. PASSERINES (*PASSERIFORMES*) – 44 species

Family X/1. Larks (*Alaudidae*) - 5 species

21. Lesser Short-toed Lark (*Calandrella rufescens*)
    Status of presence SB, PM / Conservation Status: LC
22. Calandra Lark (*Melanocorypha calandra*)
    Status of presence SB, PM / Conservation Status: LC
23. Greater Short-toed Lark (*Calandrella brachydactyla*)
    Status of presence SB, PM / Conservation Status: LC
24. Woodlark (*Lullula arborea*)
    Status of presence SB, PM / Conservation Status: LC
25. Eurasian Skylark (*Alauda arvensis*)
    Status of presence SB, PM / Conservation Status: LC

Family X/2. Swallows and Martins (*Hirundinidae*) - 2 species

26. Barn Swallow (*Hirundo rustica*)
    Status of presenceSB, SV, PM / **Conservation Status: LC**
27. Northern House Martin (*Delichon urbica*)
    Status of presence SV, SB, PM/ Conservation Status: LC

Family X/3. Wagtails and Pipits (*Motacillidae*) - 4 species

28. Tree Pipit (*Anthus trivialis*)
    Status of presence SB, PM / Conservation Status: LC
29. Tawny Pipit (*Anthus campestris*)
    Status of presenceSB, PM / **Conservation Status: LC**
30. Pied, or White, Wagtail (*Motacilla alba*)
    Status of presence YR-V, SB, PM / Conservation Status: LC
31. Yellow Wagtail (*Motacilla flava*) (*Motacilla cinerea*)
    Status of presence SV(SB?) PM / **Conservation Status:LC**

Family X/4.Shrikes (*Laniidae*) – 2 species

32. Lesser Grey Shrike (*Lanius minor*)
    Status of presence SB, PM / Conservation Status: LC
33. Red-backed Shrike (*Lanius collurio*)
    Status of presence SB, PM / Conservation Status:LC

Family X/5.Warblers (*Sylvidae*) - 4 species

34. Common Whitethroat (*Sylvia communis*)
    Status of presence SB, PM / Conservation Status: LC
35. Blackcap (*Sylvia atricapilla*)
    Status of presence SB, PM / Conservation Status: LC
36. Common Chiffchaff (*Phylloscopus collybita*)
    Status of presence SB, PM / Conservation Status: LC
37. Greenish Warbler (*Phylloscopus trochiloides*)
    Status of presence PM / Conservation Status: LC

Family X/6.*Muscicapidae* – 7 species

38. Spotted Flycatcher (*Muscicapa striata*)
    Status of presence SB, PM/ Conservation Status: LC
39. Common Stonechat (*Saxicola torquata*)
    Status of presence SB, PM/ Conservation Status: LC
40. Whinchat (*Saxicola rubetra*)
    Status of presence SB, PM/ Conservation Status: LC
41. Northern Wheatear (*Oenanthe oenanthe*)
    Status of presence PM/ Conservation Status: LC
42. Isabelline Wheatear (*Oenanthe isabellina*)
    Status of presence SB, PM/ Conservation Status: LC
43. Common Redstart (*Phoenicurus phoenicurus*)
    Status of presence SB, PM/ Conservation Status: LC
44. European Robin (*Erithacus rubecula*)
    Status of presence YR-R/ Conservation Status: LC

Family X/7. Thrushes (*Turdidae*) - 3 species

45. Common Blackbird (*Turdus merula*)
    Status of presence YR-R/ Conservation Status: LC
46. Song Thrush (*Turdus philomelos*)
    Status of presence SB?, PM / Conservation Status: LC
47. Mistle Thrush (*Turdus viscivorus*)
    Status of presence SB?, PM, WV / Conservation Status: LC

Family X/8. Long-tailed Tits (*Aegithalidae*) - 1 species

48. Long-tailed Tit (*Aegithalos caudatus*)
    Status of presence YR-R / **Conservation Status: LC**

Family X/9. Tits (*Paridae*) -2 species

49. Great Tit (*Parus major*)
    Status of presence YR-R / **Conservation Status: LC**
50. Blue Tit (*Parus caeruleus*)

Status of presence YR-R / Conservation Status: LC

Family X/10. Wrens (*Troglodytidae*) - 1 species

51. Winter Wren (*Troglodytes troglodytes*)
Status of presence YR-R / Conservation Status: LC

Family X/11. Sparrows (*Passeridae*) –2 species

52. Tree Sparrow (*Passer montanus*)
Status of presence YR-R / Conservation Status: LC
53. House Sparrow (*Passer domesticus*)
Status of presence YR-R / Conservation Status: LC

Family X/12. Starlings (*Sturnidae*) - 1 species

54. Common Starling (*Sturnus vulgaris*)
Status of presence YR-V, SB, PM, WV / Conservation Status: LC

Family X/13. Crows (*Corvidae*) - 4 species

55. Eurasian Jay (*Garrulus glandarius*)
Status of presence YR-R / Conservation Status: LC
56. Magpie (*Pica pica*)
Status of presence YR-R / Conservation Status: LC
57. Hooded Crow (*Corvus cornix*)
Status of presence YR-R / Conservation Status: LC
58. Common Raven (*Corvus corax*)
Status of presence YR-R / Conservation Status: LC

Family X/14. Finches (*Fringillidae*) - 3 species

59. Common Chaffinch (*Fringilla coelebs*)
Status of presence YR-R/ Conservation Status: LC
60. European Goldfinch (*Carduelis carduelis*)
Status of presence YR-R. PM, WV/ Conservation Status: LC
61. European Greenfinch (*Carduelis chloris*)
Status of presence YR-R / Conservation Status: LC

Family X/15. Buntings (*Emberizidae*) - 3 species

62. Corn Bunting (*Milaria calandra*)
Status of presence SB, PM/ Conservation Status: LC
63. Black-headed Bunting (*Emberiza melanocephala*)
Status of presence SB, PM/ Conservation Status: LC
64. Ortolan Bunting (*Emberiza hortulana*)
Status of presence SB, PM/ Conservation Status: LC

5 Target bird species

5.1. Main results of survey of target bird species carried out in summer 2022

Ten target bird species, including seven Birds of Prey (*Falconiformes*), two owl species (*Strigiformes*) and Common Quail (*Coturnix coturnix*), were observed in summer 2022: Short-toed Snake-eagle (*Circaetus gallicus*), Eurasian Sparrowhawk (*Accipiter nisus*), Common Buzzard (*Buteo buteo*), Long-legged Buzzard (*Buteo rufinus*), Western Marsh Harrier (*Circus aeruginosus*), Montagu's Harrier (*Circus pygargus*), Common Kestrel (*Falco tinnunculus*), Eurasian Scops-owl (*Otus scops*), Little Owl (*Athene noctua*) and Common Quail (*Coturnix coturnix*).

In total, at least 181 individuals of 9 target species, not counting about 40 sightings of the Common Quail (*Coturnix coturnix*), recorded during 2022 summer surveys carried out within the limits of Ruisi WPP Project Area and in adjacent areas. Of them, 173 individuals were representatives of seven species of Birds of Prey (*Falconiformes*) and 8 individuals were representatives of two species of Owls (*Strigiformes*) were recorded.

At least 102 individuals of 6 raptor species counted during direct visual observations carried out three vantage points.

42 individuals of 6 raptor species and 7 individuals of 2 owl species, among them 4 individuals of Little Owl (*Athene noctua*) and 3 individuals of Eurasian Scops-owl (*Otus scops*), recorded during surveys on foot.

Besides that, 29 individuals of 6 raptor species and one Little Owl observed during road-car surveys carried out in the area under consideration in summer 2022.

The following 7 species of the Birds of Prey which associated in two families (*Accipitridae* – 6 species) and (*Falconidae* – 1 species) were recorded during field works:

ORDER - Birds of Prey (*FALCONIFORMES*) - 7 species
Family I/1. Buzzards, etc (*Accipitridae*) – 6 species
- Short-toed Snake-eagle (*Circaetus gallicus*)
- Eurasian Sparrowhawk (*Accipiter nisus*)
- Common Buzzard (*Buteo buteo*)
- Long-legged Buzzard (*Buteo rufinus*)
- Western Marsh Harrier (*Circus aeruginosus*)
- Montagu's Harrier (*Circus pygargus*)

Family I/2. Falcons (*Falconidae*) - 1 species
- Common Kestrel (*Falco tinnunculus*)

ORDER - Owls (*STRIGIFORMES*) - 2 species
Family Owls (*Strigidae*) - 2 species
- Eurasian Scops-owl (*Otus scops*)
- Little Owl (*Athene noctua*)

The most widespread and numerous raptor was Common Buzzard (*Buteo buteo*) - 119 individuals were counted during summer 2022 survey.

Widespread and common, but not numerous, were two species - Common Kestrel (*Falco tinnunculus*) – 32 individuals and Long-legged Buzzard (*Buteo rufinus*) –12 individuals.

Other four raptor species and two owl species were very rare in small numbers visitors: Eurasian Sparrowhawk (*Accipiter nisus*) – 3 individuals, Montagu's Harrier (*Circus pygargus*) – 3 individuals, Short-toed Snake-eagle (*Circaetus gallicus*) – 2 individuals, Western Marsh Harrier (*Circus aeruginosus*) – 2 individuals.

Besides that, 56 raptors were recorded in adjacent areas – at the distance from 2000 m to 3000 m from the nearest turbines: Common Buzzard (*Buteo buteo*) – 23 individuals, Common Kestrel (*Falco tinnunculus*) – 17 individuals, Long-legged Buzzard (*Buteo rufinus*) – 7 individuals, Western Marsh Harrier (*Circus aeruginosus*) – 3 individuals, Eurasian Sparrowhawk (*Accipiter nisus*) – 2 individuals, Montagu's Harrier (*Circus pygargus*) – 2 individuals, Short-toed Snake-eagle (*Circaetus gallicus*) – 2 individuals

Generalized information on the flight altitude of the target bird species observed in the summer of 2022 is given below in Table 5-1 and Figure 5-1.

Table 5-1 Height of flight of the target bird species recorded during observations from vantage point in summer 2022 (n – 173 records)

Height of flight	Number of individuals	In %
-20	28	1.53
20 – 50	40	11.59
50 – 100	36	28.58
100 – 200	31	10.05
200 - 300	26	28.92
300 – 500	10	13.77
500+	2	5.56
Totals	**173**	**100.00**

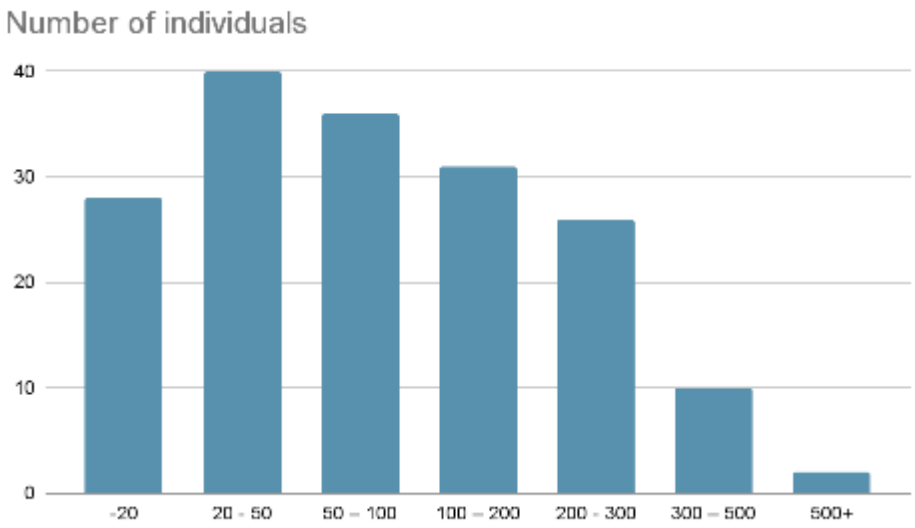


Figure 5-1 Height of flight of the target bird species recorded during observations from vantage point in summer 2022

5.2. Detailed results of counts of the target bird species carried out from three vantage points in summer 2022

Vantage Point No 1

Date: June 5, 2022
Time: From 09:40 to 14:00
Duration: 4 hours and 20 minutes
6 individuals of 3 species were observed: Common Buzzard – 4 individuals, Western Marsh Harrier -1 individual, Common Kestrel – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
09:54-09:55	Common Buzzard	1	~200	E	

	Buteo buteo				
10:44-10:45	Common Buzzard *Buteo buteo*	1	130-150	N	
11:20-11:21	Western Marsh Harrier *Circus aeruginosus*	1	5-10	NE	female
12:03-12:04	Common Buzzard *Buteo buteo*	1	~100	NE	
12:52-12:54	Common Buzzard *Buteo buteo*	1	100-150	E	
13:27	Common Kestrel *Falco tinnunculus*	1	40-50	N	

Date: June 7, 2022
Time: From 07:30 to 12:15
Duration: 4 hours and 45 minutes
2 individuals of 1 species were observed: Common Buzzard – 2 individuals

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
09:19-09:20	Common Buzzard *Buteo buteo*	1	~100	E	
11:43-11:44	Common Buzzard *Buteo buteo*	1	~150	N	

Date: June 9, 2022
Time: From 09:20 to 14:45 (5 hours and 25 minutes) and from 16:45 to 19:50 (3 hours and 5 minutes)
Duration: 9 hours and 35 minutes in total
7 individuals of 4 species were observed: Common Buzzard – 4 individuals, Long-legged Buzzard– 1 individual, Montagu's Harrier – 1 individual, Common Kestrel – 1 individuals

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
09:38-09:40	Common Buzzard *Buteo buteo*	1	133-152	X	soaring
10:14-10:16	Common Buzzard *Buteo buteo*	1	~200	NE	
10:49-10:50	Common Kestrel *Falco tinnunculus*	1	15-20	E	
11:37-11:38	Long-legged Buzzard *Buteo rufinus*	1	80-100	W	
12:41	Montagu's Harrier *Circus pygargus*	1	~10	SW	female
13:53-13:54	Common Buzzard *Buteo buteo*	1	50-70	SE	
18:41-18:42	Common Buzzard *Buteo buteo*	1	200	E	

Date: June 22, 2022
Time: From 07:40 to 14:10 (6 hours and 30 minutes) and from 16:45 to 19:50 (3 hours and 5 minutes)
Duration: 9 hours and 55 minutes in total

6 individuals of 3 species were observed: Common Buzzard – 4 individuals, Long-legged Buzzard – 1 individual, Common Kestrel – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
09:52-09:54	Common Buzzard *Buteo buteo*	1	210-244	E	
10:40	Common Kestrel *Falco tinnunculus*	1	~30	NE	
12:01-12:02	Common Buzzard *Buteo buteo*	1	~200	N	
12:55	Common Kestrel	1	10-20	SE	

	Falco tinnunculus				
14:04-14:05	Long-legged Buzzard *Buteo rufinus*	1	120-150	E	
17:33-17:34	Common Buzzard *Buteo buteo*	1	~100	NW	

Date: June 25, 2022
Time: From 08:40 to 12:50 (4 hours and 10 minutes) and from 16:15 to 19:00 (2 hours and 45 minutes)
Duration: 6 hours and 55 minutes in totall
6 individuals of 4 species were observed: Short-toed Snake-eagle – 1 individual, Common Buzzard – 3 individuals, Long-legged Buzzard– 1 individual, Common Kestrel – 1 individuals

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
09:35-09:36	Common Buzzard *Buteo buteo*	1	~120	NE	
09:56-09:57	Common Kestrel *Falco tinnunculus*	1	~50	SE	
11:22-11:23	Common Buzzard *Buteo buteo*	1	~150	S	
12:42-12:43	Common Kestrel *Falco tinnunculus*	1	15-20	N	
16:53-16:55	Long-legged Buzzard *Buteo rufinus*	1	120-150	E	
17:07-17:08	Common Buzzard *Buteo buteo*	1	~100	N	
18:11-18:12	Short-toed Snake-eagle *Circaetus gallicus*	1	207-230+	W	

Date: July 3, 2022
Time: From 08:00 to 12:14 (4 hours and 45 minutes) and from 15:50 to 19:20 (3 hours and 30 minutes)
Duration: 8 hours and 15 minutes in total
9 individuals of 2 species were observed: Common Buzzard – 5 individuals, Common Kestrel – 4 individuals

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
09:14-09:15	Common Buzzard *Buteo buteo*	1	~100	E	
10:10-10:12	Common Buzzard *Buteo buteo*	1	200+	SE	
11:07-11:08	Common Buzzard *Buteo buteo*	1	100-120	NE	
16:10-16:11	Common Buzzard *Buteo buteo*	1	80-100	NE	
16:54-16:57	Common Buzzard *Buteo buteo*	1	~100	N	
17:33-17:38	Common Kestrel *Falco tinnunculus*	1	0-20	X	Pair with two juveniles

Date: July 9, 2022
Time: From 07:50 to 12:30 (4 hours and 40 minutes) and from 16:45 to 19:15 (2 hours and 30 minutes)
Duration: 7 hours and 10 minutes
4 individuals of 3 species were observed: Common Buzzard – 3 individuals, Western Marsh Harrier - 1 individual, Common Kestrel – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
08:59-09:01	Common Buzzard *Buteo buteo*	1	~200	SE	
09:54-09:55	Common Buzzard *Buteo buteo*	1	~200	N	
10:34-10:35	Common Kestrel *Falco tinnunculus*	1	40-50	E	
19:03-19:05	Western Marsh Harrier *Circus aeruginosus*	1	5-15	S	male

Vantage Point No 2

Date: June 11, 2022
Time: From 10:15 to 18:00
Duration: 7 hours and 45 minutes
9 individuals of 3 species were observed: Common Buzzard – 6 individuals, Long-legged Buzzard – 1 individual, Common Kestrel – 2 individuals

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
10:42-10:44	Common Buzzard *Buteo buteo*	1	220-238	NE	
11:18-11:19	Long-legged Buzzard *Buteo rufinus*	1	212-225	E	
11:57-11:58	Common Buzzard *Buteo buteo*	1	115 - 133	N	
12:32-12:33	Common Kestrel *Falco tinnunculus*	1	20-30	SE	
13:17	Common Buzzard *Buteo buteo*	1	~150	NE	
14:05-14:06	Common Buzzard *Buteo buteo*	1	~150	E	
14:54-14:56	Common Kestrel *Falco tinnunculus*	1	~10	N	
15:35	Common Buzzard *Buteo buteo*	1	200+	NW	
16:21-16 22	Common Buzzard *Buteo buteo*	1	144-152	E	

Date: June 13, 2022
Time: From 08:15 to 12:45 (4 hours and 30 minutes) and from 16:15 to 19:30 (3 hours and 15 minutes)
Duration: 7 hours and 45 minutes
11 individuals of 3 species were observed: Common Buzzard – 7 individuals, Long-legged Buzzard – 1 individual, Common Kestrel – 3 individuals

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
09:00-09:03	Common Kestrel *Falco tinnunculus*	1	10-20	NE	
09:45-09:46	Common Buzzard *Buteo buteo*	1	186-197	N	
10:14-10:15	Common Buzzard *Buteo buteo*	1	107-112	NE	
10:56-10:57	Common Buzzard *Buteo buteo*	1	~200	W	
11:52-11:54	Common Buzzard *Buteo buteo*	1	176-185	N	

12:12-12:15	Common Kestrel *Falco tinnunculus*	1	20-40	E	
16:37-16:38	Long-legged Buzzard *Buteo rufinus*	1	122-128	NE	
16:52-16:53	Common Buzzard *Buteo buteo*	1	60-70	NW	
17:23-17:24	Common Kestrel *Falco tinnunculus*	1	10-15	E	
18:07-18:08	Common Buzzard *Buteo buteo*	1	~200	NE	
18:55-18:57	Common Buzzard *Buteo buteo*	1	120-140	N	

Date: June 15, 2022
Time: From 09:30 to 14:50
Duration: 5 hours and 20 minutes
4 individuals of 2 species were observed: Common Buzzard – 3 individuals, Common Kestrel – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
09:54-09:56	Common Buzzard *Buteo buteo*	1	~200	E	
11:03-11:05	Common Buzzard *Buteo buteo*	1	120-140	N	
12:51-12:53	Common Kestrel *Falco tinnunculus*	1	10-20	SE	
14:08-14:09	Common Buzzard *Buteo buteo*	1	~100	E	

Date: June 20, 2022
Time: From 07:45 to 12:50
Duration: 5 hours and 5 minutes
8 individuals of 3 species were observed: Common Buzzard – 5 individuals, Long-legged Buzzard – 1 individual, Common Kestrel – 2 individuals

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
08:57-08:58	Common Buzzard *Buteo buteo*	1	~180	E	
09:23-09:24	Common Buzzard *Buteo buteo*	1	200+	W	
10:04-10:05	Common Kestrel *Falco tinnunculus*	1	~50	N	
10:18-11:20	Common Buzzard *Buteo buteo*	1	~200	W	
11:42-11:43	Common Kestrel *Falco tinnunculus*	1	20-50	NE	
12:24-12:25	Long-legged Buzzard *Buteo rufinus*	1	200+	SE	
12:41-12:43	Common Buzzard *Buteo buteo*	1	120-140	N	

Date: July 1, 2022
Time: From 08:10 to 12:20 (4 hours and 10 minutes) and from 17:15 to 20:00 (2 hours and 45 minutes)
Duration: 6 hours and 55 minutes
6 individuals of 2 species were observed: Common Buzzard – 4 individuals, Common Kestrel – 2 individuals

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
09:22-09:23	Common Buzzard *Buteo buteo*	1	131-140	NE	
10:14-10:15	Common Buzzard *Buteo buteo*	1	211-215	E	
11:41-11:43	Common Buzzard *Buteo buteo*	1	50-75	N	
12:03-12:05	Common Kestrel *Falco tinnunculus*	1	10-15	E	
18:12-18:19	Common Buzzard *Buteo buteo*	1	X	X	Watched on ground hunting on rodents in field
18:52	Common Kestrel *Falco tinnunculus*	1	25-30	W	

Date: July 5, 2022
Time: From 07:20 to 12:30 (5 hours and 10 minutes) and from 18:10 to 20:00 (1 hours and 50 minutes)
Duration: 7 hours in total
5 individuals of 2 species were observed: Common Buzzard – 4 individuals, Montagu's Harrier – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
09:18-09:20	Common Buzzard *Buteo buteo*	1	120-130	E	
10:43-10:45	Montagu's Harrier *Circus pygargus*	1	5-15	NW	female
12:16	Common Buzzard *Buteo buteo*	1	40-50	E	
18:25-18:27	Common Buzzard *Buteo buteo*	1	100-120	SE	
19:02-19:04	Common Buzzard *Buteo buteo*	1	200+	NW	

Vantage Point No 3

Date: June 18, 2022
Time: From 08:10 to 12:40 (4 hours and 30 minutes) and from 16:40 to 20:00 (3 hours and 20 minutes)
Duration: 7 hours and 50 minutes in total
8 individuals of 3 species were observed: Common Buzzard – 4 individuals, Eurasian Sparrowhawk – 1 individual, Common Kestrel – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
08:41	Eurasian Sparrowhawk *Accipiter nisus*	1	10-15	SE	female
09:31-09:32	Common Buzzard *Buteo buteo*	1	200+	W	
10:16-10:18	Common Buzzard *Buteo rufinus*	1	180-200	N	
11:01-11:02	Common Buzzard *Buteo buteo*	1	100-150	X	Soaring in fields about 300 m from VP No3
12:23	Common Buzzard *Buteo buteo*	1	200+	NW	

17:32-17:33	Common Kestrel *Falco tinnunculus*	1	30-50	NE	
18:18-18:20	Common Buzzard *Buteo buteo*	1	120-150	E	
19:03-19:04	Common Buzzard *Buteo buteo*	1	~200	NE	

Date: June 29, 2022
Time: From 07:30 to 14:15
Duration: 6 hours and 45 minutes
6 individuals of 2 species were observed: Common Buzzard – 4 individuals, Common Kestrel – 2 individuals

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
08:54-08:55	Common Buzzard *Buteo buteo*	1	210 - 222	W	
09:22-09:23	Common Buzzard *Buteo buteo*	1	107-115	E	
11:44-11:47	Common Kestrel *Falco tinnunculus*	1	202-220	NE	
12:14-12:15	Common Buzzard *Buteo buteo*	1	187-198	N	
13:18-13:20	Common Buzzard *Buteo buteo*	1	220+	E	
13:41-13:44	Common Kestrel *Falco tinnunculus*	1	5-20	SE	

Date: July 7, 2022
Time: From 08:15 to 15:00
Duration: 6 hours and 45 minutes
5 individuals of 1 species were observed: Common Buzzard – 5 individuals

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
08:34-08:35	Common Kestrel *Falco tinnunculus*	1	155-167 0	NW	
09:02-09:03	Common Buzzard *Buteo buteo*	1	212-215	NE	
09:31-09:35	Common Buzzard *Buteo buteo*	1	142-175	NE	
10:11	Common Buzzard *Buteo buteo*		200+	W	
11:53-11:54	Common Buzzard *Buteo buteo*	1	176-185	N	

Date: July 12, 2022
Time: From 07:30 to 12:50 (5 hours and 20 minutes) and from 16:20 to 19:40 (3 hours and 20 minutes)
Duration: 8 hour and 40 minutes
9 individuals of 2 species were observed: Common Buzzard – 8 individuals, Common Kestrel – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
08:54-08:58	Common Buzzard *Buteo buteo*	3	10-100	X	Pair with fledged juvenile
09:47-09:48	Common Buzzard *Buteo buteo*	1	~100	SE	
11:21-11:22	Common Buzzard *Buteo buteo*	1	100-150	NE	

12:31-12:32	Common Kestrel *Falco tinnunculus*	1	10-20	S	
16:56-16:57	Common Buzzard *Buteo buteo*	1	150+	E	
17:33	Common Buzzard *Buteo buteo*	1	200+	NE	
18:51-18:53	Common Buzzard *Buteo buteo*	1	500+	NW	

Date: July 15, 2022
Vantage Point No 3
Time: From 08:20 to 14:30
Duration: 6 hours and 10 minutes
4 individuals of 2 species were observed: Common Buzzard – 3 individuals, Long-legged Buzzard – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
08:53-08:55	Long-legged Buzzard *Buteo rufinus*	1	163-188	S	
10:14-10:19	Common Buzzard *Buteo buteo*	1	80-100	NE	
11:50:11:53	Common Buzzard *Buteo buteo*	1	122-141	NW	
14:10-14:11	Common Buzzard *Buteo buteo*	1	~150	NE	

5.3. Detailed results of counts of the target bird species carried out during surveys on foot in summer 2022

Date, time and duration: June 5, 2022; from 08:20 to 09:40 (1 hour and 20 minutes) and from 14:00 to 19:20 (5 hours and 20 minutes), totally 6 hours and 40 minutes;

5 individuals of 3 species were observed: Common Buzzard – 3 individuals, Long-legged Buzzard – 1 individual, Common Kestrel – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
09:26 – 09:29	Common Buzzard *Buteo buteo*	2	210-245	E and NE	
14:31 – 14:32	Common Kestrel *Falco tinnunculus*	1	10-20	E	
16:02 – 16:03	Long-legged Buzzard *Buteo rufinus*	1	200 – 230	N	
16:49 - 16:53	Common Buzzard *Buteo buteo*	1	200+	NW	

Date, time and duration: June 7, 2022; from 12:15 to 15:15 (2 hours) and from 17:40 to 21:15 (3 hours and 35 minutes), totally 5 hours and 35 minutes;

4 individuals of two species were observed: Common Buzzard – 3 individualsm Eurasian Sparriowhawk – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
12:41 – 12:42	Common Buzzard *Buteo buteo*	1	110-12	N	
14:07	Common Buzzard *Buteo buteo*	1	~200	E	
15:04 – 15:05	Common Buzzard *Buteo buteo*	1	140-150	E	
18:44	Eurasian Sparrowhawk Accipiter nisus	1	20-25	S	female

Date, time and duration: June 9, 2022; from 08:30 to 09:20 (50 minutes) and from 14:45 to 18:45 (4 hours), totally 4 hours and 50 minutes;

2 individuals of 1 species were observed: Common Buzzard – 2 individuals

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
15:22 – 15:24	Common Buzzard *Buteo buteo*	1	~150	SE	
17:07 - 17:08	Common Buzzard *Buteo buteo*	1	200+	W	

Date, time and duration: June 11, 2022; from 08:00 to 10:15 (2 hours and 15 minutes) and from 18:00 to 20:30 (2 hours and 30 minutes), totally 4 hours and 45 minutes;

1 individual of 1 species was observed: Common Buzzard – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
18:14 - 18:16	Common Buzzard *Buteo buteo*	1	120-150	E	

Date, time and duration: June 13, 2022; from 12:45 to 18:15 (5 hours and 30 minutes)

3 individuals of 2 species were observed: Common Buzzard – 2 individuals, Long-legged Buzzard – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
12:58 – 12:59	Common Buzzard *Buteo buteo*	1	100-120	E	
15:15 – 15:17	Long-legged Buzzard *Buteo rufinus*	1	200+	E	
17:01 - 17:02	Common Buzzard *Buteo buteo*	1	70-80	N	

Date, time and duration: June 15, 2022; from 07:20 to 09:30 (2 hours and 10 minutes) and from 14:50 to 18:15 (3 hours and 25 minutes), 4 hours and 35 minutes;

2 individuals of 2 species were observed: Common Buzzard – 1 individual, Common Kestrel – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
15:30 – 15:32	Common Buzzard *Buteo buteo*	1	~150	S	
16:53	Common Kestrel *Falco tinnunculus*	1	40-50	NE	

Date, time and duration: June 18, 2022; from 12:40 to 18:50 (6 hour and 10 minutes)
1 individuals of 1 species were observed: Common Buzzard – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
16:11	Common Buzzard *Buteo buteo*	1	~180	SE	

Date, time and duration: June 20, 2022; from 14:45 to 20:00 (5 hours and 15 minutes)

4 individuals of 2 species were observed: Common Buzzard – 3 individuals, Common Kestrel – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
15:05 – 15:07	Common Buzzard *Buteo buteo*	1	170-200	N	
15:55	Common Buzzard *Buteo buteo*	1	200+	NW	

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
16:44-16:45	Common Buzzard *Buteo buteo*	1	80-100	NE	
14:31 – 14:32	Common Kestrel *Falco tinnunculus*	1	10-20	SW	

Date, time and duration: June 22, 2022; from 14:10 to 16:45 (2 hours and 35 minutes) and from 19:50 to 21:15 (1 hour and 25 minutes), totally 3 hours and 50 minutes
2 individuals of 2 species were observed: Common Buzzard – 1 individual, Montagu's Harrier – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
15:22 – 15:23	Common Buzzard *Buteo buteo*	2	210-245	E and NE	
19:57 – 19:58	Montagu's Harrier *Circus pygargus*	1	10-20	SW	male

Date, time and duration: June 25, 2022; from 12:50 to 15:30 (2 hours and 40 minutes) and from 19:00 to 20:50 (1 hour and 50 minutes), totally 4 hours and 30 minutes

2 individuals of 1 species were observed: Common Buzzard – 2 individuals

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
13:14	Common Buzzard *Buteo buteo*	1	150~	E	
14:54 - 14:55	Common Buzzard *Buteo buteo*	1	~120	NW	

Date, time and duration: June 29, 2022; from 14:15 to 18:45 (4 hours and 30 minutes)
2 individuals of 2 species were observed: Common Buzzard – 1 individual, Long-legged Buzzard – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
14:52	Common Buzzard *Buteo buteo*	1	~120	NW	
17:22 – 17:23	Long-legged Buzzard *Buteo rufinus*	1	~150	E	

Date, time and duration: July 1, 2022; from 13:00 to 17:15 (4 hours and 15 minutes);
1 individuals of 1 species was observed: Common Buzzard – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
15:55	Common Buzzard *Buteo buteo*	1	500+	S	

Date, time and duration: July 3, 2022; from 07:20 to 08:00 (40 minutes) and from 12:45 to 15:50 (3 hours and 5 minutes), totally 3 hours and 45 minutes
No target species

Date, time and duration: July 5, 2022; 12:30 to 18:10 (5 hour and 40 minutes);
2 individuals of 2 species were observed: Common Buzzard – 1 individual, Common Kestrel – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
15:05 – 15:07	Common Kestrel *Falco tinnunculus*	1	170-200	N	
16:25	Common Buzzard *Buteo buteo*	1	~200	W	

Date, time and duration: July 7, 2022; from 15:00 to 19:10 (4 hours and 10 minutes);

1 individual of 1 species were observed: Common Buzzard – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
18:09	Common Buzzard *Buteo buteo*	1	~200	E	

Date, time and duration: July 9, 2022; from 12:30 to 16:45 (4 hours and 15 minutes)

2 individuals of 2 species were observed: Common Buzzard – 1 individual, Short-toed Snake-eagle – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
16:11	Common Buzzard *Buteo buteo*	1	~180	SE	
16:32 – 16:34	Short-toed Snake-eagle *Circaetus gallicus*	1	200+	S	

Date, time and duration: July 12, 2022; 12:50 to 16:20 (3 hours and 30 minutes);

No target species

Date, time and duration: July 15, 2022; from 14:30 to 16:00 (1 hour and 30 minutes)

No target species

5.4. Results of counts of the target bird species carried out during Road-Car Surveys in summer 2022

Date, time and duration: June 5, 2022; from 07:40 to 08:20 (40 minutes) and from 19:20 to 19:50 (30 minutes), totally 1 hour and 10 minutes;
Area: Eastern (in morning) and northern (in evening) parts of the Project Area

2 individuals of 1 species were observed: Common Buzzard - 2

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
08:11-08:12	Common Buzzard *Buteo buteo*	1	~150	E	
19:23	Common Buzzard *Buteo buteo*	1	200+	SE	

Date, time and duration: June 7, 2022; from 15:15 to 17:40 (2 hours and 25 minutes)
Area: Eastern and south-eastern parts of the Project Area

1 individual of 1 species were observed: Common Buzzard - 1

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
16:22-16:24	Common Buzzard *Buteo buteo*	1	0-20	X	Hunting on rodents

Date, time and duration: June 9, 2022; from 08:00 to 08:30 (30 minutes) and from 18:45 to 19:45 (1 hour), totally 1 hour and 30 minutes;
Area: South-western corner of the Project Area and adjacent areas in the Mtkvari River flood-land

No target species

Date, time and duration: June 11, 2022; from 06:50 to 08:00 (1 hour and 10 minutes)
Area: South-eastern corner of the Project Area

No target species

Date, time and duration: June 13, 2022; from 18:15 to 19:30 (1 hour and 15 minutes)
Area: North-western part of the Project Area

6 individuals of 3 target species were observed: Common Buzzard – 4 individuals, Long-legged Buzzard – 1 individual, Common Kestrel – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
18:22-18:26	Common Buzzard *Buteo buteo*	1	X	X	Pair with 2 juveniles were seen hunting on rodents
18:44	Long-legged Buzzard *Buteo rufinus*	1	~150	NW	
18:31	Common Kestrel *Falco tinnunculus*	1	~20	NE	

Date, time and duration: June 15, 2022; from 18:15 to 19:50 (1 hours and 35 minutes)
Area: Fields in the central part of the Project Area

2 individuals of 2 target species were observed: Common Buzzard – 1, Common Kestrel – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
18:28-18:29	Common Buzzard *Buteo buteo*	1	~100	SW	
19:11	Common Kestrel *Falco tinnunculus*	1	15-20	W	

Date, time and duration: June 18, 2022; from 06:30 to 08:10 (1 hour and 40 minutes) from 18:50 to 20:45 (1 hour and 55 minutes), totally 3 hours and 35 minutes;
Area: Fields in the central part and along eastern borders of the Project Area

2 individuals of 2 target species were observed: Common Buzzard – 1, Common Kestrel – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
08:01	Common Kestrel *Falco tinnunculus*	1	~50	NE	
19:04-19:06	Common Buzzard *Buteo buteo*	1	150-200	X	Soaring along eastern border

Date, time and duration: June 20, 2022; from 12:50 to 14:45 (2 hours and 5 minutes)
Area: Fields in the central and northern parts of the Project Area
4 individuals of 3 target species were observed: Common Buzzard – 2 individuals, Long-legged Buzzard – 1 individual, Common Kestrel – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
13:31-13:32	Common Buzzard *Buteo buteo*	1	200+	E	
14:14-14:17	Long-legged Buzzard *Buteo rufinus*	1	120-150	X	soaring
18:31	Common Kestrel *Falco tinnunculus*	1	~20	NE	

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
19:03-19:04	Common Buzzard *Buteo buteo*	1	~100	S	

Date, time and duration: June 22, 2022; from 07:10 to 07:40 (30 minutes)
Area: Northern part of the Project Area

No target species

Date, time and duration: June 25, 2022; from 15:30 to 16:50 (1 hour and 20 minutes)
Area: Fields in the central part of the Project Area

2 individuals of 1 target species were observed: Common Buzzard – 2 individuals

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
15:51-15:52	Common Buzzard *Buteo buteo*	1	~200	NW	
16:16-16-17	Common Buzzard *Buteo buteo*	1	150-180	S	

Date, time and duration: June 29, 2022; from 18:45 to 19:50 (1 hour and 5 minutes)
Area: Fields around Ruisi village and southern part of the Project Area

No target species

Date, time and duration: July 1, 2022; from 12:20 to 13:00 (40 minutes) and from 20:00 to 20:15 (15 minutes), totally 55 minutes
Area: Western part of the Project Area

No target species

Date, time and duration: July 3, 2022; from 07:00 to 07:20 (20 minutes) and from 19:20 to 21:10 (1 hour and 50 minutes), totally 2 hours and 10 minutes
Area: Northern and north-western parts of the Project Area

1 individual of 1 target species was observed: Eurasian Sparrowhawk – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
07:14	Eurasian Sparrowhawk *Accipiter nisus*	1	10-15	SE	female

Date, time and duration: July 5, 2022; from 06:00 to 07:20 (1 hour and 20 minutes)
Area: Fields in the central and northern parts of the Project Area

2 individuals of 2 target species were observed: Common Buzzard – 1 individual, Common Kestrel – 1 individual

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
07:03-07:04	Common Kestrel *Falco tinnunculus*	1	10-15	N	
07:10-07:11	Common Buzzard *Buteo buteo*	1	~100	SE	

- July 7, 2022; from 19:10 to 19:50 (40 minutes);

Date, time and duration: July 9, 2022; from 19:15 to 20:30 (1 hour and 15 minutes)
Area: Fields in the central part of the Project Area

3 individuals of one target species were observed: Common Buzzard – 3 individuals

Time	Name of species	Number of individuals	Flight height	Flight direction	Remarks
19:17-19:20	Common Buzzard *Buteo buteo*	1	X	X	Pair with juvenile

Date, time and duration: July 12, 2022; from 19:40 to 20:00 (20 minutes)
Area: Fields between Dirbi and Breti villages

No target species

Date, time and duration: July 15, 2022; from 16:00 to 16:30 (30 minutes)
Area: Southern part of the Project Area and adjacent areas along the motor-road

No target species

5.5 Detailed review on the separate target species

This chapter provides only general information about the target bird species counted during monitoring works carried out within the limits of Ruisi WPP as well as in adjacent areas from 3 June 2022 to 15 July 2022. Detailed information about separate records, indicating the location of observation, the time and duration of the separate individuals presence in the field of view, the altitude and direction of their flights, behavioral features, etc., was dictated to a Digital Voice Recorder Olympus WS-853 and later were used during the preparation of the final report.

The following ten target bird species - seven Birds of Prey (*Falconiformes*), two owl species (*Strigiformes*) and Common Quail (*Coturnix coturnix*), were observed in summer 2022:

ORDER - Birds of Prey (*FALCONIFORMES*) - 7 species
Family I/1. Buzzards, etc (*Accipitridae*) – 6 species
- Short-toed Snake-eagle (*Circaetus gallicus*)
- Eurasian Sparrowhawk (*Accipiter nisus*)
- Common Buzzard (*Buteo buteo*)
- Long-legged Buzzard (*Buteo rufinus*)
- Western Marsh Harrier (*Circus aeruginosus*)
- Montagu's Harrier (*Circus pygargus*)

Family I/2. Falcons (*Falconidae*) - 1 species
- Common Kestrel (*Falco tinnunculus*)

ORDER - Owls (*STRIGIFORMES*) - 2 species
Family Owls (*Strigidae*) - 2 species
- Eurasian Scops-owl (*Otus scops*)
- Little Owl (*Athene noctua*)

Order *GALLIFORMES* – 1 species
Family Pheasants, Quals – 1 species
- Common Quail (*Coturnix coturnix*)

► **Information on the separate target species**

- Short-toed Snake-eagle (*Circaetus gallicus*) - Rare passage visitor and occasional summer non-breeding visitor. Two Short-toed Snake-eagles were noted in summer 2022. Single was observed on June 25 from vantage point No 1 (picture 5-1). This bird was watched during 1.5 – 2 min (18:11-18:12) flying across area to western direction at height from 207 m to 230+ m. Another solitary individual was recorded in evening on July 9, 2022 during survey on foot along northern border of study area.

Picture 5-1. Short-toed Snake-eagle (*Circaetus gallicus*); July 9, 2022

- Eurasian Sparrowhawk (*Accipiter nisus*) - Three individuals, all solitary females, were counted during summer 2022 survey: one was watched from vantage point No 3 in morning (08:41) on June 18, one was watched in the north-western corner of the Project Area in evening (18:44) on June 7 flying at height 20 – 25 m to southern direction and one was recorded in evening on 12 July during road-car-survey carried out along northern border of study area.

Picture 5-2. Eurasian Sparrowhawk (*Accipiter nisus*), female; June 18, 2022

- Common Buzzard (*Buteo buteo*) - Widespread and numerous passage visitor, common, but not numerous, non-breeding summer visitor to the Project Area. Common migratory breeder in woodlands, adjacent with study area and irregular in small numbers winterer (picture 5-3). Observed in various habitats in all sections of study area, but prefers mosaic landscapes where forests alternate with open and semi-open areas. More often observed in fields and pastures with sparse vegetation, along edge of artificial pine forests (pictures 5-4, 5-5 and 5-6). Breeds in adjacent areas – nesting territories of three pairs were recorded in 2.5, 3.3 and 4.0 km of the borders of Project Area. 119 individuals were counted during summer 2022 survey within the limits of Ruisi WPP Project Area. 78 individuals were counted from three vantage points (27 from VP No 1, 29 from VP No 2 and 24 individuals from VP No 3), 24 individuals were recorded during surveys on foot and 19 individuals were watched during road-car surveys.

Picture 5-3. Common Buzzard (*Buteo buteo*); June 18, 2022

Picture 5-4. Hunting habitats of Common Buzzard (*Buteo buteo*) in the western part of the Ruisi WPP Project Area; July 9, 2022

Picture 5-5. Hunting habitats of Common Buzzard (*Buteo buteo*) in the central part of the Ruisi WPP Project Area; July 9, 2022

Picture 5-6. Hunting habitats of Common Buzzard (*Buteo buteo*) in the south-eastern corner of the Ruisi WPP Project Area; July 7, 2022

- Long-legged Buzzard (*Buteo rufinus*) - Widespread and common, but not numerous, passage visitor and rare in small numbers winterer. Rare summer visitor without breeding (picture 5-7). Breeding of several pairs was recorded in adjacent areas – at the Kvernaki Ridge. 12 individuals of Long-legged Buzzard (*Buteo rufinus*) were recorded during summer 2022 survey at the area under consideration. 7 individuals were counted from three vantage points (3 individuals from VP No 1, 3 from VP No 2 and 1 individual from VP No 3), 3 individuals were recorded during surveys on foot and 2 individuals were watched during road car surveys.

Picture 5-7. Long-legged Buzzard (*Buteo rufinus*); July 7, 2022

- Western Marsh Harrier (*Circus aeruginosus*) - Only 2 solitary individuals, one female and one male, were counted within the limits of study area in summer 2022. Female was observed from vantage point No 1 on June 5 (11:20 – 11:21 AM) flying to north-eastern direction at height 5 0 10 m and male was seen also from vantage point No 1 in evening (19:03 – 19:05) on July 9 flying to southern direction at height 5 – 15 m (picture 5-8).

Picture 5-8. Western Marsh Harrier (*Circus aeruginosus*), male; July 9, 2022

- Montagu's Harrier (*Circus pygargus*) - **Status of presence SV, PM** / **Conservation Status: LC.** Rare occasional non-breeding summer visitor. Only three solitary individuals were observed in summer 2022 – one was watched from VP No 1, one from VP No 2 and one individual was recorded during survey on foot.

Family I/2. Falcons (*Falconidae*) - 1 species

- Common Kestrel (*Falco tinnunculus*) - **Status of presence PM, SV** / **Conservation Status: LC.** Widespread and common non-breeding summer visitor and transit migrant and quite common breeding raptor species in adjacent areas (picture 5-9). 32 common kestrels were counted within the limits of Ruisi WPP Project Area in summer 2022. These falcons were recorded in open habitats in all parts of study area. 23 individuals were counted from three vantage points (9 individuals from VP No 1, 10 individuals from VP No 2 and 4 individuals from VP No 3); 7 individuals recorded during survey on foot and 2 individuals were seen during road-car survey. Besides that, 17 individuals were watched in adjacent areas. These birds typically observed in fields with sparse vegetation (pictures 5-10 and 5-11). More often observed flying at height from 10 … 20 m to 50 m, rarely higher.

Picture 5-9. Common Kestrel (*Falco tinnunculus*); June 26, 2022

Picture 5-10. Hunting habitats of Common Kestrel (*Falco tinnunculus*) in central part of study area; June 29, 2022

Picture 5-11. Hunting habitats of Common Kestrel (*Falco tinnunculus*) in southern part of study area; July 3, 2022

Order II. *GALLIFORMES* – 1 species

Family II/1. Pheasants, Quals – 1 species

- Common Quail (*Coturnix coturnix*) - Widespread and common passage visitor and migratory breeder. Presence of about 50 pairs was confirmed by direct visual records and typical calls in all parts of study area. Breeds in various open and semi-open habitats including cultivated fields, dry meadows and pastures (pictures 5-12, 5-13 and 5-14).

Picture 5-12. Breeding habitats of Common Quail (*Coturnix coturnix*) in western part of study area; June 29, 2022

Picture 5-13. Breeding habitats of Common Quail (*Coturnix coturnix*) in north-eastern part of study area; July 1, 2022

Picture 5-14. Breeding habitats of Common Quail (*Coturnix coturnix*) in central part of study area; July 9, 2022

ORDER V. *STRIGIFORMES* - 2 species

Family V/1. Owls (*Strigidae*) - 2 species

- Eurasian Scops-owl (*Otusscops*) - **Status of presence SB, PM / Conservation Status: LC.** Widespread and common migratory breeder and passage visitor. Inhabits open woodlands, areas with scattered trees, young forests, brushwood and old, large gardens in villages and field-protective forest belts. For nesting it usually uses the old Magpie's (*Pica pica*) nests. More common and numerous in adjacent areas. According to the materials collected during summer 2022 survey, the number estimated at least four pairs within the limits of Nigoza WPP Project Area, all were recorded along western borders of study area.

- Little Owl (*Athene noctua*) - **Status of presence YR-R / Conservation Status: LC.** Widespread and common year-round resident to all parts of the 205 MV Ruisi WPP Project Area (5-15). Breeds in dry open habitats. Breeding pairs were recorded at gentle arid slopes with stony outcroppings and ravines, in ruins, around villages. No data on total numbers, probably 12-15 pairs nests within the limits of study area. Nesting of five pairs was confirmed in abandoned buildings, in ruins and wall of canal. Two nests were found in central part of the Project Area (pictures 5-16 and 5-17). Besides that three pairs with fledged young individuals were recorded in summer 2022 in other points.

Picture 5-15. Little Owl (*Athene noctua*) near nest found in hole between WTG No 21 and WTG No 25

Picture 5-16.Breeding and hunting habitats of Little Owl (*Athene noctua*) in the central part of study area

Picture 5-17. Pellets and prey remains in the overnight stay of Little Owl (*Athene noctua*) in the central part of Project Area; June29, 2022

6 Other Bird Species

ORDER III. *COLUMBIFORMES* - 3 species

Family III/1. Pigeons and Doves (*Columbidae*) - 4 species

- Feral Pigeon (*Columba livia f. domesticus*) - **Status of presence YR-V / Conservation Status: LC.** Year-round resident in villages situated within the limits of Project Area and around borders of study area. Flocks, consisting 5-20 individuals were watched feeding in fields along southern and western borders of the Project Area on June 11, June 22, July 3, July 7 and July 12.

- Common Wood Pigeon (*Columba palumbus*) - **Status of presence PM, SV / Conservation Status: LC.** Rare non-breeding summer visitor and widespread and common passage visitor. More common in adjacent areas. Single was observed flying across central part of study area on July 12, 2022.

- Eurasian Collared Dove (*Streptopelia decaocto*) - **Status of presence YR-R or SB? / Conservation Status: LC.** Common but non numerous breeder in some settlements (picture 6-1). The exact number of breeding pairs is uncertain, possibly at least 10 pairs nest in villages Ruisi, Breti, Dirbi and Sasireti. More common in adjacent areas.

Picture 6-1. Eurasian Collared Dove (*Streptopelia decaocto*); July 9, 2023

ORDER IV. *CUCULIFORMES* - 1 species

Family IV/1. Cuckoos (*Cuculidae*) - 1 species

- Common Cuckoo (*Cuculus canorus*) - Widespread and common late spring and early autumn passage visitor and migratory breeder (picture 6-3). Observed in wide variety of habitats in all parts of the Ruisi WPP Project Area as well as in adjacent areas, but more often observed in various woodlands along western and south-western borders of the Ruisi WPP Project Area. Solitary individuals regularly were observed during summer survey. Additionally, presence of the common cuckoo in all parts of study area was confirmed by typical voice (calls). No data on total numbers. An analysis of all sightings suggests that during the nesting period, at least 20 individuals are regularly represented in the territory under consideration.

Picture 6-2. Common Cuckoo (*Cuculus canorus*); June 11, 2023

ORDER VI. *CAPRIMULGIFORMES*- 1 species

Family VI/1. Nightjars (*Caprimulgidae*)

- Eurasian Nightjar (*Caprimulgus europaeus*) – Common passage visitor and migratory breeder to some parts of study area. Solitary individuals several times were recorded flying along edges of artificial

pine forests and in fields near woodlands in south-eastern, central and south-western parts of the Ruisi WPP Project Area (pictures 6-3 and 6-4). According to the expert assessment of the author of the report, about 20 pairs nest in the area under consideration.

Picture 6-3. Habitats of Eurasian Nightjar (*Caprimulgus europaeus*) in central part of study area; June 9, 2022

Picture 6-4. Habitats of Eurasian Nightjar (*Caprimulgus europaeus*) in south-western part of study area; July 15, 2022

ORDER VII. *APODIFORMES* - 1 species

Family VII/1. Swifts (*Apodidae*) - 1 species

- Common Swift (*Apus apus*) - Widespread and numerous passage visitor and common breeding summer visitor (picture 6-5). Breeds in all human settlements, nests were found in walls and under roofs of various buildings in all villages located within the limits of study area.Numerous flocks of feeding swifts regularly were observed in all parts of study area as well as in adjacent areas (picture 6-6). No data on total numbers of breeding pairs.

Picture 6-5. Common Swift (*Apus apus*), young fledged individual; July 5, 2022

Picture 6-6. Flock of Common Swift (*Apus apus*); July 15, 2022

ORDER VIII. *CORACIIFORMES* - 3 species

Family VIII/1. Bee-eaters (*Meropidae*) - 1 species

- European Bee-eater (*Merops apiaster*) - Widespread and very common transit migrant and more-or-less common non-breeding summer visitor (picture 6-7). Breeding was confirmed in adjacent areas – two small colonies were found in the flood-land of the Mtkvari River 2 - 3 km south and 7 – 8 km south-west of study area. Small flocks, consisting of from 5 to 10, rarely more, individuals in each, totally ca. 70, several times were observed in the late June – first half of July 2022. Usually these birds were watched in open and semi-open habitats flying at heights from 20 to 250 m or sitting on scattered trees and high bushes in fields;

Picture 6-7. European Bee-eater (*Merops apiaster*)l July 5, 2022

Family VIII/2. Hoopoes (*Upupidae*) - 1 species

- Eurasian Hoopoe (*Upupa epops*) - **Status of presence SB, PM / Conservation Status: LC.** Widespread and common passage visitor and migratory breeder to all parts of the Ruisi WPP Project Area (picture 6-8). Solitary individuals, pairs, including pairs with fledged juveniles, regularly were watched in summer 2022. Most of records were noted in open wood, pastures and cultivated fields with scattered trees and high bushes, artificial protective tree–lines along roads, near villages, etc. (pictures 6-9, 6-10 and 6-11).Two nests and five breeding territories were found during survey in June – July 2022. No data on numbers, probably at least 15 pairs nest in area under consideration.

Picture 6-8. Eurasian Hoopoe (*Upupa epops*); July 15, 2022

Picture 6-9. Breeding habitats of Eurasian Hoopoe (*Upupa epops*) in the eastern part of study area; July 1, 2022

Picture 6-10. Breeding habitats of Eurasian Hoopoe (*Upupa epops*) in the south-eastern corner of study area; July 3, 2022

Picture 6-11. Breeding habitats of Eurasian Hoopoe (*Upupa epops*) in the central part of study area; July 5, 2022

Family VIII/3. Rollers (*Coraciidae*) - 1 species

- European Roller (*Coracias garrulous*) - Common passage visitor and rare in small numbers non-breeding summer visitor to area under consideration (picture 6-11). Breeding of several pairs was confirmed in adjacent areas. More often recorded in open and semi-open dry landscapes with mixed vegetation, scattered trees and bushes, also near artificial woodlands, farms, villages (picture 6-12). Solitary individuals several times were recorded in central, eastern and northern parts of the Project Area on June 25, July 5, July 12 and July 15.

Picture 6-11. European Roller (*Coracias garrulous*); June 15, 2022

Picture 6-12. Habitats of European Roller (*Coracias garrulous*); July 15, 2022

ORDER IX. *PICIFORMES* - 2 species

Family IX/1. Woodpeckers (*Picidae*) - 2 species

- Great Spotted Woodpecker (*Dendrocopos major*) - **Status of presence YR-R / Conservation Status: LC.** Common, but in general not numerous and sporadically recorded, year-round resident with local seasonal movements.Observed in or near woodlands, including artificial pine forests.More common and numerous in adjacent areas.Always observed by solitary individuals. No data on total numbers of breeding pairs, probably local breeding group estimate 3 -5 breeding pairs. Five times solitary individuals were recorded in June-July 2022 in the western and south-western parts of study area and one record was noted in artificial pine forest in south-eastern part of study area (pictures 6-13 and 6-14).

Picture 6-13. Habitats of Great Spotted Woodpecker (*Dendrocopos major*) in western part of study area; July 12, 2022

Picture 6-14. Habitats of Great Spotted Woodpecker (*Dendrocopos major*) in south-eastern part of study area; July 1, 2022

B. PASSERINES

Order X. PASSERINES (*PASSERIFORMES*) – 45 species

Family X/1. Larks (*Alaudidae*) - 5 species

- Lesser Short-toed Lark (*Calandrella rufescens*) - **Status of presence SB, PM / Conservation Status: LC.** Widespread and common migratory breeder and Passage visitor to wide variety of open habitats. Not counted.

- Calandra Lark (*Melanocorypha calandra*) - **Status of presence SB, PM / Conservation Status: LC.** Widespread and common summer breeder and transit migrant. Recorded in open and semi-open habitats in all sections of study area. Noit counted.

- Greater Short-toed Lark (*Calandrella brachydactyla*) - **Status of presence SB, PM / Conservation Status: LC.** Widespread and common migratory breeder and passage migrant to all parts of the Ruisi WPP Project Area as well as to adjacent areas. Breeds in open habitats of various types. Not counted.

- Woodlark (*Lullula arborea*) - Common migratory breeder and transit migrant in woodlands of all types (picture 6-15). Most of records were noted in woodlands in western and south-western parts of study area (picture 6-16). Solitary pairs were observed in artificial pine forests. More widespread and numerous in adjacent areas. Not counted. Density in suitable habitats varied from 8 to 12 individuals per 1 km of counting route. Woodlark should be classified as a dominant or sub-dominant bird species to woodlands of study area.

Picture 6-15. Woodlark (*Lullula arborea*)

Picture 6-16. Typical habitats of Woodlark (*Lullula arborea*); June 7, 2022

- Eurasian Skylark (*Alauda arvensis*) - Widespread and numerous migratory breeding bird species (picture 6-17 in the wide variety of open habitats in all parts of study area - in fields, meadows, pastures, glades (pictures 6-18, 6-19 and 6-20). Not counted. This bird should be considered as a dominant species to various open and semi-open habitats of study area with a density from 20 to 40 breeding pairs per 1 sq. km. The highest density was registered in cultivated fields and pastures between WTG No 03 and WTG No 08;

Picture 6-17. Eurasian Skylark (*Alauda arvensis*); 5 June 2022

Picture 6-18. Breeding habitats of Eurasian Skylark (*Alauda arvensis*) in the central part of study area; June 25, 2022

Picture 6-19. Breeding habitats of Eurasian Skylark (*Alauda arvensis*) in the north-eastern part of study area; June 29, 2022

Picture 6-20. Habitats of Eurasian Skylark (*Alauda arvensis*) in the western part of study area; July 12, 2022

Family X/2. Swallows and Martins (*Hirundinidae*) - 2 species

- Barn Swallow (*Hirundo rustica*) - **Status of presenceSB, SV, PM** / **Conservation Status: LC.** Widespread and very common migratory breeder and passage visitor. Not counted. Nests were found in roofs and walls in various buildings, ruins, technical constructions, etc. in all villages located within the limits of Project Area as well as in adjacent areas.

- Northern House Martin (*Delichon urbica*) - **Status of presence SV, SB, PM/ Conservation Status: LC.** Widespread and common summer breeder and transit migrant (picture 6-21). Recorded in all various habitats. Nests were found in all settlements located within the limits of study area as well as in adjacent areas. Not counted.

Picture 6-21. Northern House Martin (*Delichon urbica*); June 20, 2022

Family X/3. Wagtails and Pipits (*Motacillidae*) - 4 species

- Tree Pipit (*Anthus trivialis*) - **Status of presence SB, PM / Conservation Status: LC.** Widespread and common migratory breeding bird species in wide variety of habitats. Inhabits natural woodlands of various types, artificial pine forests, protective tree-lines along roads, gardens in villages, etc. (picture 6-22). No data on total numbers, density in suitable habitats was 12 - 20 individuals per 1 km of counting route.

Picture 6-22. Tree Pipit (*Anthus trivialis*), juvenile; July 7, 2022

- Tawny Pipit (*Anthus campestris*) - **Status of presence SB, PM** / **Conservation Status: LC.** Widespread and quite common migratory breeding bird species and passage visitor in dry open habitats of study area, more numerous in cultivated fields and pastures in the central part and along northern, eastern and south-eastern borders of Ruisi WPP Project Area (picture 6-23). According to data collected in summer 2022, at least 120 pairs nested in the area under consideration.

Picture 6-23. Typical breeding habitats of Tawny Pipit (*Anthus campestris*) in the south-eastern part of study area; July 3, 2022

- Pied, or White, Wagtail (*Motacilla alba*) - **Status of presence YR-V, SB, PM / Conservation Status: LC.** Common, but in general not numerous, migratory breeder and passage visitor. More common in adjacent areas, especially along western edge of study area. Inhabits wide variety of habitats. Breeding of solitary pairs, totally ca. 20, was recorded in settlements located in western part of study area.

- Yellow Wagtail (*Motacillaflava*) (*Motacilla cinerea*) - **Status of presence SV(SB?) PM** / **Conservation Status: LC.** Rare irregular summer visitor without breeding. Three times solitary individuals were observed in wet habitats along western border of study area. Breeds in small numbers in adjacent areas.

Family X/4.Shrikes (*Laniidae*) – 2 species

- Lesser Grey Shrike (*Lanius minor*) - **Status of presence SB, PM / Conservation Status: LC.** Common but not numerous, migratory breeder and passage visitor (picture 6-24) to open woodlands, fields and pastures with scattered and high bushes. No data on total numbers of breeding pairs, probably at least 30 pairs nests in study area.

Picture 6-24. Lesser Grey Shrike (*Lanius minor*); June 18, 2022

- Red-backed Shrike (*Lanius collurio*) - **Status of presence SB, PM / Conservation Status: LC.** Widespread and quite common migratory breeder and transit migrant (picture 6-25) to all sections of study area. Inhabits open woodlands, fields with scattered and grouped low trees and high bushes (picture 6-26). Probably 120 – 150 pairs nests in the Ruisi WPP Project Area with highest density in central and south-eastern parts.

Picture 6-25. Red-backed Shrike (*Lanius collurio*), juvenile; July 5, 2022

Picture 6-26. Breeding habitats of Red-backed Shrike (*Lanius collurio*) along southern borders of study area; July 3, 2022

Family X/5.Warblers (*Sylvidae*) - 4 species

- Common Whitethroat (*Sylvia communis*) - **Status of presence SB, PM / Conservation Status: LC.** Widespread and common passage visitor and migratory breeder (picture 6-27). Within the limits of Ruisi WPP Project Area as well as in the whole Georgia presented by sub-species *S.c.icterops*. Observed in wide variety of habitats, but prefers lighted up and rarefied plots of woodlands, glades with saved undergrowth along the western limits of study area (picture 6-28). Besides that, nests in orchards and in villages. Density in suitable habitats in western part of study area varied from 7 to 10 pairs/1 sq. km.

Picture 6-27. Common Whitethroat (*Sylvia communis*); June 22, 2022

Picture 6-28. Habitats of Common Whitethroat (*Sylvia communis*) in south-western corner of Project Area; June 22, 2022

- Blackcap (Sylvia *atricapilla*) - **Status of presence SB, PM / Conservation Status: LC.** Widespread and common migratory breeder and transit migrant (picture 6-29). Breeding pairs regularly were observed in deciduous woodlands at plots with thick under-growth in the western and south-western parts of study area. No data on total numbers, density of breeding pairs in suitable habitats varied from 4 to 7 singing males per 1 km of route.

Picture 6-29.Blackcap (*Sylvia atricapilla*); female; June 22, 2022

- Common Chiffchaff (*Phylloscopus collybita*) – **Status of presence SB, PM / Conservation Status: LC.** Widespread and common migratory breeder and passage visitor to woodlands of various types. Prefers wet plots with dense vegetation. More common in adjacent areas - in woodlands along western border and in south-western corner of study area. No data on total numbers of breeding pairs to the whole Project Area. Density in suitable habitats varied from 10 to 15 individuals per 1 km of counting route.

Family X/6.*Muscicapidae* – 7 species

- Spotted Flycatcher (*Muscicapa striata*) - **Status of presence SB, PM/ Conservation Status: LC.** Widespread and common migratory breeder, the same for passage (picture 6-30). Several tens were observed during summer survey. Occurs in wide variety of habitats. Most of records were registered at forest edges, roadsides, in fields with scattered trees and bushes. No data on total numbers of breeding pairs; density in suitable habitats varied from 4 to 10 individuals per 1 km of counting route.

Picture 6-30. Spotted Flycatcher (*Muscicapa striata*); July 3, 2022

- Common Stonechat (*Saxicola torquata*) - **Status of presence SB, PM/ Conservation Status: LC.** Widespread and common but not numerous migratory breeder (picture 6-31). Occurs in semi-open habitats - in fields, pastures, at large glades with scattered low trees and bushes. No data on numbers.

Picture 6-31. Common Stonechat (*Saxicola torquata*), juvenile; July 7, 2022

- Whinchat (*Saxicola rubetra*) - **Status of presence SB, PM/ Conservation Status: LC.** Widespread and common passage visitor and migratory breeder (picture 6-32). Recorded in wide variety of habitats

in all parts of the Ruisi WPP Project Area. Breeds in open woodlands at plots with thick under-growth. No data on numbers.

Picture 6-32. Whinchat (*Saxicola rubetra*); June 18, 2022

- Northern Wheatear (*Oenanthe oenanthe*) - **Status of presence PM, SV / Conservation Status: LC.** Widespread and common passage visitor and rare occasional summer visitor without breeding. Three solitary individuals were watched on July 9 (n - 1) and July 15 (n - 2) in central parts of monitored area. All three records were noted in open habitats with stony outcrops.

- Isabelline Wheatear (*Oenanthe isabellina*) - **Status of presence SB, PM/ Conservation Status: LC.** Widespread, but in general not numerous, migratory breeder and quite common passage visitor to the Project Area (picture 6-33). Usually recorded in dry open habitats. Several tens were watched during summer survey.

Picture 6-33. Isabelline Wheatear (*Oenanthe isabellina*)

- Common Redstart (*Phoenicurus phoenicurus*) - **Status of presence SB, PM/ Conservation Status: LC.** Common but locally distributed migratory breeder and transit migrant to various woodlands of monitored area (picture 6-34). At least 15 pairs were recorded in woodlands along western borders of the Project Area and about 10 pairs were watched in other parts of study area including gardens in villages.

Picture 6-34. Common Redstart (*Phoenicurus phoenicurus*), female

- European Robin (*Erithacus rubecula*) - **Status of presence YR-R / Conservation Status: LC.** Common yer-round resident or, probably, partial migrant (picture 6-35). More common in adjacent area. Breeding of several pairs, not more than ten, was confirmed along western border of study area - in woodlands between villages Dirbi and Breti near WTG No 22 and west of the WTG No 42. Besides that, several times solitary individuals were recorded in gardens near villages Ruisi and in the south-western corner of study area near WTG No 10, WTG No 15 and WTG No 57.

Picture 6-35. European Robin (*Erithacusrubecula*); June 11, 2022

Family X/7. Thrushes (*Turdidae*) - 3 species

- Common Blackbird (*Turdus merula*) - **Status of presence YR-R / Conservation Status: LC.** Widespread and common year-round resident with local seasonal movements (picture 6-36). Inhabits wide variety of habitats, more often observed in or near various woodlands, gardens, villages, rarely in fields with scattered and grouped trees and bushes. Not counted.

Picture 6-36. Common Blackbird (*Turdus merula*), male; June 7, 2022

- Song Thrush (*Turdus philomelos*) - **Status of presence SB, PM / Conservation Status: LC.** More-or-less common migratory breeder and widespread and common passage visitor to almost all woodlands. More common in adjacent areas. About 20 individuals including three pairs were recorded during summer survey.

- Mistle Thrush (*Turdus viscivorus*) - **Status of presence SB, PM, WV / Conservation Status: LC.** Common, but not numerous, migratory breeder, passage visitor and rare irregular winterer to monitored area. Observed in various woodlands, but for breeding prefers deciduous forests. More common in adjacent areas. About 30 solitary individuals and several pairs were recorded in summer 2022. One nest with four juveniles was found on June 7 in south-western corner of study area (picture 6-37).

Picture 6-37. Nest of Mistle Thrush (*Turdus viscivorus*); June 7, 2022

<u>Family X/8. Long-tailed Tits (*Aegithalidae*)</u> - 1 species

- Long-tailed Tit (*Aegithalos caudatus*) - **Status of presence YR-R / Conservation Status: LC.** Widespread and common, but in general not numerous, year-round resident with local seasonal movements. Within the limits of Ruisi WPP Project Area, like in the whole Caucasus, this bird species is represented by local sub-species *Aegithalos caudatus major*. During breeding season prefers young woodlands, forest edges, valleys of brooks in the deciduous forests. More common in adjacent areas. About 20 solitary individuals and at least four pairs with juveniles were recorded in summer 2022.

Family X/9. Tits (*Paridae*) -2 species

- Great Tit (*Parus major*) - **Status of presence YR-R** / **Conservation Status: LC.** Widespread and common year-round resident with local seasonal movements. Typically watched in woodlands of various types, more often observed in woodlands along western limits of Project Area, in south-western corner of study area and in artificial pine forests along eastern border. No data on numbers of breeding pairs. Two nests were found in summer 2022 (picture 6-38).

Picture 6-38. Nest of Great Tit (*Parus major*) found in tree-hole in the artificial pine forest in south-eastern part of Project Area; June 5, 2022

- Blue Tit (*Paruscaeruleus*) - **Status of presence YR-R** / **Conservation Status: LC.** More-or-less common, but in general not numerous, year-round resident (picture 6-39). In summer observed in various woodlands in all parts of monitored area, more often along western borders of study area. For breeding prefers hedgerows, bushy heats, dry open woodlands, abandoned gardens.

Picture 6-39. Blue Tit (*Parus caeruleus*); June 5, 2022

Family X/10. Wrens (*Troglodytidae*) - 1 species

- Winter Wren (*Troglodytes troglodytes*) - **Status of presence YR-R** / **Conservation Status: LC.** Common year-round resident. Inhabits various woodlands, thickets, gardens. More often observed by solitary individuals. About 20 solitary individuals were recorded in summer 2022.

Family X/11. Sparrows (*Passeridae*) – 2 species

- Tree Sparrow (*Passer montanus*) - **Status of presence YR-R** / **Conservation Status: LC.** Common year-round resident with local seasonal movements. Regularly were observed in various habitats in all parts of monitored area. Most of records were in semi-open habitats, near woodlands, along roads and near various economical buildings, farms, ruins, around villages. Not counted.

- House Sparrow (*Passer domesticus*) - **Status of presence YR-R** / **Conservation Status: LC.** Common year-round resident. Inhabits all parts of study area. Nests in various buildings located within the limits of Project Area. Regularly observed by flocks feeding in fields in all parts of study area (pictures 6-40 and 6-41). Not counted.

Picture 6-40. House Sparrows (*Passer domesticus*); June 20, 2022

Picture 6-41. Breeding habitats of House Sparrow (*Passer domesticus*); Jujy 9, 2022

Family X/12. Starlings (*Sturnidae*) - 1 species

- Common Starling (*Sturnus vulgaris*) - **Status of presence YR-V, SB, PM, WV / Conservation Status: LC.** Common year-round visitor, passage migrant and winterer (picture 6-42). Irregularly breeds in villages located in study area. Small flocks, pairs and solitary individuals regularly were seen flying across area or feeding in cultivated fields, gardens. More common in adjacent areas. No data on numbers.

Picture 6-42. Common Starling (*Sturnus vulgaris*); June 25, 2022

Family X/13. Crows (*Corvidae*) - 4 species

- Eurasian Jay (*Garrulus glandarius*) - **Status of presence YR-R** / **Conservation Status: LC.** Rare year-round visitor. Typically observed by solitary individuals in or near woodlands. No data on number of breeding pairs. More common in adjacent areas. Five solitary individuals were recorded in western part of study area and two individuals were watched in artificial pine forests near south-eastern limits of the Project Area.

- Magpie (*Pica pica*) - **Status of presence YR-R** / **Conservation Status: LC.** Widespread and common year-round resident to all parts of study area as well as to adjacent area (picture 6-43). Usually observed in semi-open habitats with a highest density in fields with scattered trees and high bushes and in protective tree-lines along roads and around villages. Not counted. 21 occupied nests were found during summer survey in all parts of study area.

Picture 6-43. Magpie (*Pica pica*); June 11, 2022

- Hooded Crow (*Corvus cornix*) - **Status of presence YR-R** / **Conservation Status: LC.** Widespread and common year-round resident to all parts of the Ruisi WPP Project area as well as to adjacent areas. Occurred in fields, pastures, near villages, farms, along motor-roads, etc. Not counted. 16 nests were found during summer survey within the limits of study area.

- Common Raven (*Corvus corax*) - **Status of presence YR-R** / **Conservation Status: LC.** Common year-round non-breeding visitor to study area. Solitary individuals, pairs and small flocks regularly were seen flying at height 100-200 m or feeding on ground in fields and pastures.

Family X/14. Finches (*Fringillidae*) - 3 species

- Common Chaffinch (*Fringilla coelebs*) - **Status of presence YR-R/ Conservation Status: LC.** Widespread and common year-round resident/partial migrant, migratory breeder, passage visitor and irregular winter visitor. Recorded in wide variety of habitats, typically in woodlands and gardens. More common in adjacent areas. Sub dominant bird species to woodlands. Not counted.

- European Goldfinch (*Carduelis carduelis*) - **Status of presence YR-R. PM, WV/ Conservation Status: LC.** Widespread and common year-round resident or partial migrant, passage visitor (picture 6-44) and winterer to all parts of monitored area. More common in fields with scattered low trees and bushes, pastures, villages, along roads. Not counted.

Picture 6-44. European Goldfinch (*Carduelis carduelis*); July 15, 2022

- European Greenfinch (*Carduelis chloris*) - **Status of presence YR-R** / **Conservation Status: LC.** Widespread and common migratory breeding bird species and passage visitor. Occurs in wide variety of habitats, including gardens in villages and artificial tree-lines along roads and in fields (picture 6-45). No data on total numbers of breeding pairs, several tens, including pairs near nests and fledged juveniles, were observed during survey within the borders of Project Area.

Picture 6-45. Habitats of European Greenfinch (*Carduelis chloris*); June 9, 2022

Family X/15. Buntings (*Emberizidae*) - 3 species

- Corn Bunting (*Milaria calandra*) - **Status of presence SB, PM/ Conservation Status: LC.** Widespread and quite common migratory breeder and passage visitor to all parts of the Ruisi WPP Project Area (picture 6-46) with highest density in open and semi-open habitats in the central parts of study area. Corn Bunting should be considered as a dominant bird species in the suitable habitats. Typically observed by solitary individuals or by pairs in dry open woodlands, cultivated fields, pastures with scattered and grouped trees and high bushes (picture 6-47). Not counted.

Picture 6-46. Corn Bunting (*Milaria calandra*); June 5, 2022

Picture 6-47. Breeding habitats of Corn Bunting (*Milaria calandra*)

- Black-headed Bunting (*Emberiza melanocephala*) - **Status of presence SB, PM/ Conservation Status: LC.** Widespread and common migratory breeder and passage visitor to all parts of study area (picture 6-48). Typically recorded in open tree-less habitats with scattered bushes and low trees (picture 6-49). At least 20 breeding pairs were presented in study area. More common and numerous in adjacent areas.

Picture 6-48. Black-headed Bunting (*Emberiza melanocephala*); June 22, 2022

Picture 6-49. Breeding habitats of Black-headed Bunting (*Emberiza melanocephala*) in the central part of study area; June 29, 2022

- Ortolan Bunting (*Emberiza hortulana*) - **Status of presence SB, PM/ Conservation Status: LC.** Widespread and more-or-less common migratory breeder and passage visitor to dry open and semi-open habitats (picture 6-50). 12 – 15 pairs were presented during field works in summer. Most of records were noted at gentle slopes along eastern, north-eastern borders and in south-eastern corner of the area under consideration;

Picture 6-50. Ortolan Bunting (*Emberiza hortulana*); June 18, 2022

Annex 6. Social Survey of Affected Households and Target Groups

1. Social Survey of Affected Households

Study objective and methodology

The goal of the present study was to study the socio-economic data of the population in the villages affected by of the project.

Households living in the villages affected by the project in the municipalities of Kareli and Gori were defined as the target segment of the study.

In total, 111 households were interviewed in the villages affected by the project. Households were selected purposefully (see Table 1 below).

Table N 1 – Number of Interwiuved Households in the Project Affected Villages

Munithipality	Village	Number of Interweaved Households
Qareli	Ruisi	49
Qareli	Urbnisi	4
Qareli	Dirbi	5
Qareli	Breti	13
Qareli	Sasireti	2
Qareli	Dzlevijvari	11
Qareli	Sagholasheni	7
Qareli	Bebnisi	11
Gori	Saqasheti	2
Gori	Shindisi	1
Gori	Varianis Meurneoba	6
TOTAL		**111**

Based on survey goal and objectives, in order to collect maximally reliable and comprehensive information, the study utilized quantitative survey method by means of FTF interview technique.

Field works were conducted in September 2022. There were not any significant complications during field work. In some cases, respondents refused to participate in the study and there were respondents who could not be contacted (see Table 2 below).

Table N 2: Brief description of study methodology

Research method	Quantitative study
Research technique	FTF interview
Research area	Kareli and Gori municipalities
Target segment	Project affected households
Respondent	Informed member of household
Sampling method	Purposeful sampling
Sample size	111 households
Duration of interview	15-20 minutes

Socio-demographic description of households affected by the project

Structure of households

As a result of the Study, it was revealed that extended families in which several generations live in one household are widespread in the villages affected by the project. As already mentioned, the research was conducted in 9 villages of Kareli Municipality and 3 villages of Gori Municipality:

Ruisi; Urbnisi; Dirbi Breti Sasireti; Dzlevijvari; Sagholasheni; Bebnisi; Saqasheti; Shindisi; Varianis Meurneoba. The average household size of the mentioned villages exceeds the average family size in Georgia and is 4, and according to the data of the National Statistics Service of Georgia, this indicator is equal to 3.3 for Georgia).

The existence of a traditional family type is indicated by the fact that in the majority of families there is a married middle-aged and older man as the head of the family.

In the households that are participating in the study, the share for females and males is equally distributed and is 50% for both sexes (see Tale 3 below).

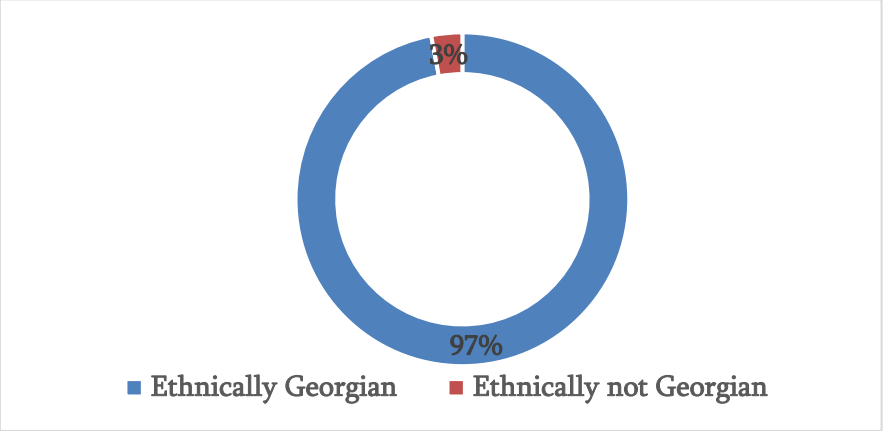
Table N3 – Age, Gender and Sex distribution among the members of households participating in the study

Age group	Male		Famale		Total	
	N	%	N	%	N	%
Children (under 6 years old)	11	5%	10	4%	21	5%
Children (6 to 18 years old)	28	13%	34	15%	62	14%
Adults (men from 18 under 65 and women from 18 to 60 up to)	155	70%	123	55%	278	63%
Retirement age (men 65 from and over, women from 60 years and more)	29	13%	56	25%	85	18%
Total	223	100%	223	100%	446	100%
%		**50.8%**		**49.2%**		**100%**

Ethnicity

According to the study results, the majority (97%) of the population in the villages affected by the project are ethnically Georgian. Non-Georgian or mixed families are rare, their share is 3% (see Figure 1 below).

Figure N 1– Ethnicity of the surveyed population (N=446)



Education

According to the data of the Project aeffected area, the level of education is approximately the same among representatives of both sexes. In total, about 5% of the population is of preschool age. More than half of the population (59%) have secondary education, 12% have technical education and almost a quarter (24%) have higher education (see Table 4 below).

Table N 4– Level of education of persons affected by the project

	Education level	Male		Female		Total	
		N	%	N	%	N	%
0	Pre-school	11	5%	10	4%	21	5%
1	Elementary / High-school	136	61%	129	58%	265	59%
2	Technical/ Vocational	23	10%	29	13%	52	12%
3	Higher	53	24%	55	25%	108	24%
	Total	223	100%	223	100%	446	100%

Vulnerable households

The number of vulnerable households in the villages affected by the project participating in the study totals 50 vulnerable HHs. Among them, 20 HHs headed by a woman (without a breadwinner), 5 HHs below the poverty line, 3 HHs - IDPs, 4 Persons with disabilities and 9 Households with income below the subsistence minimum determined by the state (317.9 GEL) (see Table 5 below). It is significant that the share of female-headed households among the surveyed families is 18%.

Table N 5: Vulnerable households identified in villages affected by the project

Vulnerability category	Number of households
Below poverty level/social allowance	5
Households headed by women	20
IDPs	3
Households with Persons with disabilities	4
Households with income below the subsistence minimum determined by the state (317.9 GEL)[2]	9
Total	41

[2] According to the 2021 data of the National Statistics Agency, the subsistence minimum for an average family is 317.9 GEL https://www.geostat.ge/ka/calendar

Income and economic status of project affected households

Sources of income

It is important to determine the monthly income of HHs to characterize the economic situation of HHs (see Table N)

In total, the average monthly income[3] of households participating in the study in the villages affected by the project amounts 546.7 GEL, which is higher than the subsistence minimum for an average family (317.9 GEL) determined by the 2021 data of the National Statistics Agency (see **Error! Reference source not found.** below)..

Table N 6: Average monthly income of households and average monthly income per capita By Villages

Village	Average monthly income per head (GEL)	Average monthly income per HH (GEL)
Bebnis	401	1964.5
Breti	438.9	1586.9
Dirbi	577.6	2888
Varianis Meurneoba	873.2	2765
Ruisi	832.7	4371
Sasireti	671.4	2350
Sakasheti	225	675
Sagolasheni	531.4	3507
Urbnisi	482.1	1687.5
Shindisi	NA[4]	NA
Dzlevijvari	414.4	1782

The main sources of income for affected households are agriculture, wages from hired labor and pension (see table**Error! Reference source not found.** below).

Table N 7 - Average household incomes by source of income

Salary from public sector	Salary from private sector	Income from agriculture	Pension	Social Allowance	Support from Relatives	Private Business	Temporary Works
264 GEL	308 GEL	1585 GEL	228 GEL	38 GEK	100 GEL	198 GEL	81GEL

Distribution of monthly household expenses

We can consider the average monthly expenditure of the family on food and all other needs (clothing, education, health care, entertainment and recreation, utility bills, transportation, etc.) as objective indicators of the economic situation. It is estimated that the larger the share of the household expenditure on food, the poorer the household.

In order to reveal the general trend of the economic situation of the project affected villages, we calculated the average percentages of family expenditure in each category.

As can be seen from Table 8 presented below, the total average monthly expenses of households amount 1549 GEL, of which the main expenses are non-food (53%). Expenditures on food products make up 47% (see Table 8 below).

[3] The average monthly household income is calculated considering all sources of income for the last 12 months
[4] The average monthly income of the household could not be determined in Shindis, because the household interviewed in the said village refused to provide information on income.

It should be noted that the respondents had difficulty calculating monthly expenses. 16 households refrained from answering the question.

Tabel N 8 - Distribution of monthly household expenses

	The structure of consumption	Average monthly expenses (GEL)	% of total expenses
1	Food	730	47%
2	Non-food	824	53%
	Average	1549	100%

The level of spread of loans

Only 14% of surveyed households have a loan, the majority of them have taken a loan from a bank (N=60HH), only 4 families have taken a loan from a private person. The description is shown in Table N 9.

Tabel N 9- loans

	loans	Number of HHs	%
1	Yes	64	14%
2	Bank	*60*	*94%*
3	Private person	*51*	*6%*
4	No	382	86%
	Total	446	100%

Household assets

Water Supply and Sewerage System

100% of the villages participating in the study have 24-hour centralized electricity and gas supply systems. However, centralized water supply and sanitation remain a challenge. Even in those villages where there is a local unified water supply system, the population faces the problem of drinking water supply during the summer months, because the population uses drinking water for irrigation due to the lack of access to irrigation wells and long droughts (see 10 below).

The inhabitants of the researched villages get their drinking water mainly from artesian wells in their yards. There is no central sewage in any of the villages under the influence of the project, the population uses local sewage "pits", where waste is accumulated and then the "pit" is cleaned periodically. There were some households that had individual sewage systems connected to local rivers and the waste was discharged into the river.In total, 86% of the HHs participating in the study use natural gas for heating and cooking, although 14% of families still use wood resources for heating in winter.

Tabel N 10 - Access to the energy resources

Electricity	Natural Gas	Central sewage system	Central water supply system	Wood
100%	100%	0%	16%	14%

Household Assets/Real Estate

In the villages affected by the project, 58% of residential houses are two-story buildings built with mixed materials (stone and block). In addition to the residential house, households have 1-3 auxiliary structures in the yard, which are used for different purposes.

Only 5% of surveyed households own real estate outside the village.

100% of households have household appliances, refrigerator, TV, washing machine, mobile phone. 15% of households own at least one vehicle, and 10% own agricultural equipment.

Household Assets/Possession of lands

100% of households participating in the study own a certain amount of agricultural land. The average area of land ownership is 4.3 ha. Households usually own 2 or more plots of agricultural land, which are often located in different areas of the village. Agricultural land areas are used by households for both annual and perennial crops. A very small part of the land is used for grazing (see table below).

For the local population, the main challenge of farming is the failure of the irrigation system and unsustainable market prices for agricultural products.

Table N 11: Average agricultural land area owned by households by villages

Village	Average land area owned by households
Bebnis	2 ha
Breti	2.3 ha
Dirbi	2.1 ha
Varianis Meurneoba	1.8 ha
Ruisi	4 ha
Sasireti	1.9 ha
Sakasheti	1.2 ha
Sagolasheni	4.3 ha
Urbnisi	2.6 ha
Shindisi	NA
Dzlevijvari	2.3

2. Social Survey of Target Groups

Focus Group Discussion with Internally displaced persons in Sakasheti IDP settlement

20th September, 2022

Research method	Qualitative study
Research technique	Focus group discussion
Research area	Gori municipality, village Sakasheti IDP settlement
Research respondent	Local women
Number of respondents	6 respondents: Resp #1 – 29 y/o – housewife Resp #2 – 49 y/o – housewife / agriculture Resp #3 – 29 y/o – housewife Resp #4 – 22 y/o – student

Everyday occupation, incomes

- In total, there are 100 cottages in Sakasheti IDP settlement. Even though residential cottages of IDPs are refurbished supplied with central water supply and gas system, essential furniture and appliances, more than half of cottages are closed or sold to non-IDP residents who do not live in cottages or use them as a summer house in summer months.
- Due to scarce opportunity of getting a job locally, internal migration rate is high in Sakasheti IDP settlement. Young people move out to the capital city and mostly elders remain in the settlement.

- As it turns out as a result of talking to respondents living in Sakasheti IDP settlement, main part of able-bodied residents of their settlement work in big cities. It was noted that those who are able to work prefer not to stay in the settlement.

- Residents have the only option to work as daily workers locally which is considered as heavy labor and is often harmful for health. 25% of respondents work on daily jobs. Mostly women work on daily jobs, but those women who have younger children cannot work on such jobs as kindergarten is three kilometers away from the settlement and there is no transportation commuting to and from the kindergarten and settlement.

- Each IDP family received 0.50 ha agricultural plot of land from the state. Part of residents could not process land and sold or rented it out, while part of them cultivate and use land for agricultural products.

- The vast majority of households harvest agricultural products for their own consumption, while part of them sell it in Gori agro market.

- As for employment of pensioners, they are not employed and are mostly involved in family farms. They take care of the household, cook dinner and babysit their grandchildren. Part of retired citizens cultivate residential plot of land, they harvest fruits and vegetables.

- Internally displaced families receive state allowance for IDPs which is 45 GEL per one person. Families are not provided with any other kind of assistance.

- Residents mostly spend money on products such as: sugar, flour, oil, pasta, rice, meat, fruit (some households have it), vegetables.

- Respondents noted that healthy diet means when one eats everything body needs – protein, healthy far, carbs, vitamins. The majority of families cannot afford to eat this way, there are families who cannot afford to buy sweets and meat at all and sometimes it is even problematic for them to buy flour to bake some bread.

Medical service

- There is no medical facility in the settlement, the nearest ambulatory is in village Sakasheti where one doctor and one nurse work but the doctor is only two times a week in the village and just issues medical referrals to patients so that they can get further medical service in Gori or Tbilisi.

- Locals mostly travel to Gori for medical service. Here is where pregnant women register and here is where residents take children for immunization.

- There is no pharmacy in the settlements, locals buy medications in Gori.

- Settlement residents have medical insurance for IDPs which is satisfactory for them.

Education

- There is no school in Sakasheti IDP settlement. The nearest school pupils go to is in village Sakasheti, 3-4 km away from the settlement. Pupils use a school bus to commute to and from the settlement.

- As assessed by respondents, local education level is satisfactory, pupils are motivated and teachers' qualification is assessed positively.

- After graduating from school, young people mostly continue studying in higher education institute. Vocational education is less popular among residents. Students mostly move to Tbilisi and remain in the same cities after completing their studies.

- There is no kindergarten in the village which is a serious problem for parents and working is problematic for them. The nearest kindergarten is in village Sakasheti, 3-4 km away from the settlement and there is no transportation serving the kindergarten, thus, parents are unable to use the service of kindergarten and are forced to refuse any job opportunity.

- It was noted that quality in higher education institutes is better, quality is higher.

- Problem of transportation to the kindergarten needs to be ultimately solved by Ministry of Education and IDPs and local and central government.

Utility services and transportation

- Utility services are available in the settlement but respondents emphasized high prices. It's particularly noticeable in winter months when residents have to turn on the heating system.

- Main problem is drinking water. As noted by respondents drinking water supply is often interrupted as residents use drinking water for irrigation purposes and irrigate agricultural land parcels. Because of this problem, residents have to store drinking water and they often use water collected for two weeks for household needs. Part of residents bring water from Gori. They try to use bottled water for children.

- 50% of residents use natural gas for heating, 30%- firewood. Approximately 7-8 cubic meters of firewood is required for heating during the season price reaching 700-800 GEL. Gas costs about the same, up to 150 GEL per month.

- IDPs do not have any exemptions on utility bills.

- Grocery and food products are not available in the village. There is neither shop or agro market locally. Locals go to Gori for grocery shopping which is related to additional time and finances.

- Respondents have to commute to Gori to withdraw their pension as there is no ATM locally, neither is mobile bank branch.

- There is a private transportation in the village, route is from the settlement to Gori but respondents emphasized inconvenient working hours of transportation, the last mini bus leaves from Gori to the settlement at 16:30 which is not convenient for those working in Gori because their work finishes at 18:00. Fee to take a taxi is 15 GEL which is also inconvenient for population with low income.

- Main route is to Gori and Tbilisi. Major part of residents either work or study in these two cities, so it is critically important for them to have access to transportation.

- IDPs do not have any privileges when it comes to transportation fee.

- As noted, no one harms the environment in the village, but locals care less on greening or cleaning of the environment, they are mostly limited to planting trees in their own yards.

- Group participants do not like living in the settlement. A major part of young people consider moving out.

Recreation areas, leisure and entertainment

- The settlement does not have any recreational spaces or places where residents would gather for entertainment and having fun. There is one sport ground which is not completed and has no soil surface.
- In addition, there is a community center opened within one of the projects, but the only activity held in this center over the past 2 years was local elections.

- When it comes to fun, residents just visit each other, drink coffee and chat.

- None of the activities or grant program / training / improvement of qualification has been conducted over the past two years.

Focus Group Discussion with women in village Ruisi

19th September, 2022

Research method	Qualitative study
Research technique	Focus group discussion
Research area	Kareli municipality, village Ruisi
Research respondent	Local women
Number of respondents	6 respondents: Resp #1– 58 y/o – employee of Public Service Hall Resp #2, 30 y/o – housewife/agriculture Resp #3, 67 y/o – pensioner Resp #4 – 69 y/o, pensioner Resp #5 – 42 y/o, Bank employee Resp #6 – 34 y/o, employee of Magticom

- As the inquiry with working age women of village Ruisi reveals, approximately 25% of local residents are hired employees, mostly in public agencies, such as school, kindergarten, public

service hall, defense, police, etc. Part of residents also work in nearby cities on professional vocations, as drivers, craftsman, consultants at shops, etc.

- It was noted that a large portion of women work as workers on daily jobs. Daily reimbursement is 40 GEL.

- Mostly women work on daily jobs as it mostly implies relatively simpler work, but it was also emphasized that working in orchards is difficult and often harmful for health.

- Almost 98% of respondents are involved in agricultural activity, part of them are involved in fruit growing, part of them produce annual crops (corn, beans, potato, vegetables, herbs…), residents use agricultural products for own consumption and they also sell part of it.

- Even though the vast majority of local residents are involved in agriculture and generate income from selling agricultural products, this activity is not perceived as a job. The job only implies those works where they get salary.

- Minimal salary in the village is considered to be 500 GEL while 1500 GEL is considered to be a high salary.
- Many village residents have higher education, but only a few of them work with their vocations, excluding teachers. As believed by female participants, women and men have equal chances of finding job.

- Migration rate is high, at least one member from each family is abroad (in USA, Turkey, Poland, etc.) to work there. It was noted that mostly women used to migrate in recent years, while now people leave together with their families.

- A large portion of incomes is spent on utility bills (gas, electricity and internet) and on bank loans. The next categories of expenses are food, education and medical service.

- Respondents believe that a large portion of families in the village have no balanced and comprehensive diet.

- Village has gas supply system and electricity supply is somewhat uninterrupted. However, there is no central sewage system and residents have drinking water problems.

- There are shops in the village both network chain and retail. There is no agro market in the village, locals take their harvest to Gori or Tbilisi (Navtlughi) agro markets. In addition, re-sellers also visit the village and collect agricultural product from residents. There are non-brand pharmacies in the village where mostly basic medications are sold, while residents have to travel to Shida Kartli or Gori to buy medications for severe chronic diseases.

- There is local ambulatory in the village with one doctor and a nurse in it. Ambulatory doctor visits two times a week from Gori which as assessed by respondents, is not sufficient. Even though there is local ambulatory in the village, Ruisi residents mostly visit Kareli and Gori for different medical services (including immunization for children). Pregnant women register in Kareli and Gori and deliver babies there. However, they are very willing to have all kinds of medical services locally.

- Village residents have heart-coronary diseases, hypertension, bone-arthritis diseases, there is a number of cancer-related diseases.

- There are three public schools in the village and quality of education is satisfactory. As noted by respondents, local pupils are motivated, teachers are rather professional and motivated to teach.

- After graduating from school, young people continue studying in Gori and Tbilisi higher education institutes. It was noted that they mostly choose Gori institute as in this case, transportation and living costs are not that high. In addition, they can live in their own families (without having to move to another city) and help them in agricultural activities.

- After graduating from institute, young people mostly stay in cities as cities offer more job opportunities.

- Respondents have positive attitude towards vocational education, they beleive that getting a job is easier if you have vocational education, but vocational education is not popular among local youngsters and they mostly choose higher education.

- Trainings are rarely held for women in the village. Respondents could recall trainings on the topics of human rights, civil education, equality. Mostly young women attended trainings, but elder women also expressed their willingness to attend trainings.

- There is not central drinking water system in the village. Households use wells. Village has natural gas supply system, but some of them use firewood for heating. There is no central sewage system in Ruisi. The village has access to internet connection provided by Magti.

- Major part of village Ruisi road has asphalt surface, however, secondary roads have no asphalt surface. There are districts that require street lighting.

- In addition to drinking water problems, residents also have problems in terms of irrigation water, even though the soil is rather productive, there is lack of irrigation which reduces productivity due to frequent draughts.
- Women do not have much spare time. Whenever they have free time, they gather to drink coffee and chat. Men gather at the gathering spot. Young people gather at the local stadium or go to Gori or the capital city to have fun.

- Job opportunities are rather scarce. Salary in the nearest cities is low and because of expenses related to transportation, working there is not convenient for locals.

- Agricultural land parcels are mostly registered on male family members, boys traditionally become heirs.

- The majority of residents of the village are ethnic Georgians and their main language is Georgian. There are no ethnicity-based conflicts among locals.

In-depth Interviews with Representative of Small and Medium-sized Business

"KARTULI KALMAKHI" LTD

Owner: Davit Kutkhashvili

Location: Kareli Municipality, Village Ruisi

Occupation: Trout production

This trout fishery was founded during the Soviet times, in 1965. From 2003, the fishery was purchased and gradually renovated. Since 2003, the owner of the fishery has changed several times. In 2016, fishery obtained government supported loan with no interest. In 2018, government supported the fishery in procurement of fish and fry under low interest offer (2%). The above-mentioned support helped the fishery to develop its activities.

6 persons are employer at the trout fishery. Part of the facility is leased to individual entrepreneur Aleksander Eliadze.

Currently, fishery annual turnover is 150 000 Georgian Lari.

Fishery has no problems with product realization. During the interview fishery owner noted that currently demand on fish and fish products is growing on the local market. Often fishery struggles to catch up with demand and plans to expend its production. Product realization is carried out using distribution service to different cities of Georgia. In addition to row fish, the fishery also produces caviar, which is supplied to factory "UMALO" located in Kareli Municipality.

The main problem, which was mentioned by the fishery director during the in-depth interview was fish disease causing massive death of the fish. Unfortunately, laboratory studying fish diseases in the country in not available, and in general the field of ichthyology is not developed.

Company plans to add additional ponds and expend its production in the future. Also, it plans to establish laboratory and initiate fish food production.

“BEBNISI 2006” LTD

Owner: Kakha Tsikarishvili

Location: Kareli Municipality, Village Bebnisi

Occupation: Trout and chicken production

Trouty fishery was established in village Bebnisi in 2006. In 2018, the company expended, purchased local poultry farm, and initiated chicken production. In 2020, the company purchased additional 75 hectares of agricultural land. Currently, alongside with the fish production, company produces chicken products and other agricultural products.

3 persons are employed at the trout fishery. Similar number of employees are responsible for the chicken farm and agricultural land, where wheat is produced.

Based on the interview it became clear that, all three directions of the business face different challenges. The most growing and sustainable profitable direction is trout fishery. Currently, demand of fish products on the local market is growing, and there are no issues related to product realization. During the past two years, price on the fish products has increased, what has positive impact on the company activity. Poultry production is unstable, product price on the market constantly changes, sometimes products are oversupplied, and supply supersedes the actual market demand. However, there are cases of product shortage. The respondent noted that, legislation does not regulate poultry product import, what hinders local production. Regarding the agriculture, the biggest problem is the lack of irrigation water, what dramatically decreases the amount of the harvest during the drought period.

The company has received preferential loan from the bank and during this period managed to expend its production. The company was interested and participated in the grant project “Produce in Georgia,” prepared project, however the effort was not successful.

At the current stage, the company does not plan to expend its operations. However, in case if the company manages to receive loan in low interest, it plans to purchase additional agricultural land.

LTD "PLASTFORE"

Owner: Mamuka Vardoshvili

Location: Kareli Municipality, Village Bebnisi

Occupation: production of plastic fruit and vegetable boxes

Company "PLASTFORE," producing plastic boxes was established in village Bebnisi in 2019.

After the company established, the owner has changed several times. Currently company has 6 employees. Production works 24 hours a day and the employees take shifts. Currently, company's annual turnover is 50 000 Georgian Lari.

Company has no problems with product realization. As company director has mentioned during the interview, currently demand on the plastic boxes on the local market is growing, and company products are sold across the country.

The main problem, which the company director has mentioned during the interview is quality of the plastic box materials. Material for the plastic box production is not manufactured in Georgia, accordingly the company is forced to buy materials from Turkey. Usually, raw material is of a low quality what results in low quality of the products and decreases the price of the boxes.

Company area holds a poultry farm and currently 4 persons are employed at this farm. The poultry business is unstable, product price on the market constantly changes, sometimes products are oversupplied, and supply supersedes the actual market demand. The respondent noted that, legislation does not regulate poultry product import, what hinders local production.

At the current stage, the company does not plan to expend its operations. However, in case if the company manages to receive loan in low interest, it plans to purchase additional agricultural land.

LTD "KEMERI" and Individual Entrepreneur Inga Salishvili

Owner: Eliko Mekvabidze and Inga Salishvili

Location: Kareli Municipality, Village Ruisi

Occupation: Pharmacy store and grocery

Both businesses are managed by women and represent category of family business. Family members are employed at the grocery store and the pharmacy.

Business owners responded that, village population has economic problems and income of the local people depends on the money sent by the migrated family members.

Due to the low purchasing power of the population usually shops work on so called "pay later" system, what hinders development of the small business. However, respondents noted that, they cannot refuse the population and give them products for "pay later" agreement.

Grocery store and the pharmacy is supplied by the owners in accordance with local demand. The pharmacy owner notes that, mainly primary care medication is supplied as demand on the rare medication is low and results is expiration of the medicine date and is harmful for the pharmacy.

LTD "KEMER" has never received financial support or grant. The pharmacy has received small grants during the BP pipeline construction process. This grant was in the amount of 1500 USD, what was a great help for the business owner and supported business expansion.

At the current stage, the grocery shop does not plan on expansion, while the pharmacy store plans to expand its business if there will be a possibility to receive grant.

Annexes: Social Survey Instruments Used

A1.Socio-Economic Survey Questionnaire for Households

Questionnaire #_____	**Household #**_____	**Date** _____
Name, last name, and ID number of head of the household		
Phone Number		

Land	**Land Number**	**Land Location**
1		
2		
3		
4		

1. Information on the Household (Name of the head of the household shall be indicated first)

#	Name, Last Name	**Gender** 1. Female 2. Male	Age	**Education** 1. No Education 2. Pre-school 3. Elementary 4. High-school 5. Technical/ Vocational 6. Higher	**Marital Status** 1. Not married 2. Married 3. Divorced 4. Widowed	**Ethnical Belonging** 1. Georgian 2. Armenian 3. Azerbaijani 4. Russian 5. Ossetian 6. Other	**Social Status** 0. None 1. Internally displaced 2. Eco-migrant 3. Pensioner 4. PWD 5. Other **(Please indicate)**
1							
2							
3							
4							
5							
6							
7							
8							
9							

2. Household Social Status

Below poverty level/social allowance		IDP Allowance		PWD Allowance		Other Social Allowance	
1. Yes	2. No	1. Yes	2. No	1. Yes	2. No	1. Yes	2. No

3. Place of Residence

City/Town	Village

4. Women Household

1. Yes	2. No

5. Household monthly income (total, including all sources of income) _____ **(Georgian Lari)**
(Please circle main source of income and in the boxes below indicate the amount, in case of no income indicate 0)
5.1 For how many months has the household been receiving monthly allowance (*please indicate)*

Salary from public sector	Salary from private sector	Income from agriculture	Pension	Social Allowance	Support from Relatives	Private Business	Temporary Works	Other ***(Please indicate)***
1	2	3	4	5	6	7	8	9

6. Loan and its Structure (yes/no, loan/debt from the bank or private person)

Bank loan		Loan from the Individual Person		Micro-financial Organization		1. No
1. Yes	2. No	1. Yes	2. No	1. Yes	2. No	

7. 1 Household assets/land

Land Plot	**Purpose** 1. Agricultural 2. Non-agricultural		**Category** 1. Housing 2. Perennial 3. Arable 4. Mowing 5. Gazing					**Area (Hectare)**	**Location** *City/Village Settlement*
1	1	2	1	2	3	4	5		
2	1	2	1	2	3	4	5		
3	1	2	1	2	3	4	5		
4	1	2	1	2	3	4	5		

7.1.1. Impact/Land

1. What is the percentage of land lost as a result of the project compared to the total area of agricultural land?	_____**%**
2. Are you losing common use pastures as a result of project implementation?	1. Yes 2. No 3. Do not Know/Hard to Answer
3. Do the project facilities and construction works limit the availability of pastures?	1. Yes 2. No 3. Do not Know/Hard to Answer
4. Do you lose the possibility of irrigation of your land as a result of the implementation of the project?	1. Yes 2. No 3. Do not Know/Hard to Answer
5. Do you lose access to drinking water as a result of the implementation of the project?	1. Yes 2. No 3. Do not Know/Hard to Answer

7.2 Household Assets/Real Estate

Facility	**Type of Facility** 1. Residential 2. Commercial 3. Auxiliary	**Number of Floors**	**Construction Material** 1. Block-brick 2. Stone 3. Wood 4. Concrete 5. Other ***(Specify)***	**City/Town**
Facility #1				
Facility #2				
Facility #3				
Facility #4				
Facility #5				

8. Moveable Property (Number)

Television	Land Line	Mobile	Internet	PC	Washing Machine	Refrigerator	Motorcycle	Vehicle	Bicycle	Agricultural Equipment	Other ***(Specify)***

9. Cattle (Number)

Cow	Sheep	Goat	Pig	Horse	Donkey	Birds	Other ***(Specify)***

10. Main Expenditures of the Household for Past 12 Months (average monthly expenditures in Georgian Lari)

Food	Other (non-food related)	Total

11. Water Supply and Sewerage System (1. Yes/2. No)

Tap Water at Home	Tap Water in the Yard	Portable Water Cistern	Common Use Well	Own Well	Spring	Other ***(Specify)***	Central Sewerage System	Pit Hole	Other ***(Specify)***

12. Energy Resources (1. Yes/2. No)

Electricity	Natural Gas	Gas Container	Wood	Other ***(Specify)***

13. Distance to Educational, Medical and Utility Services (*Distance in Km) (If none write- 55, if he/she does not know write-99)*

Local Polyclinics	Local Hospitals	Regional or City Hospital	Kindergarten	School	Higher Education Facility	Local Road	Central Highway

14. Project related Attitude

Extremely Negative	*Negative*	*Not Negative, Nor Positive*	*Positive*	*Very Positive*	*Cannot Specify*
1	2	3	4	5	9 9

14.1.What are your concerns/worries related to the project?	1. Deterioration of income and living conditions 2. Noise 3. Vibration 4. Visual Impact 5. Movement safety during the construction 6. Dust during the construction 7. Other ***(Specify)***
14.2. What benefits do you expect from the project?	1. Employment 2. Social support for infrastructural development 3. Social support programs for the community 4. Additional income to the local budget 5. Improvement of uninterrupted electricity supply 6. Other ***(Specify)***

15. Project Impact on Social-Economic Activities in the Municipality

Extremely Negative	*Negative*	*Not Negative, Nor Positive*	*Positive*	*Very Positive*	*Cannot Specify*
1	*2*	*3*	*4*	*5*	*9* *9*

16. General Remarks of the Interviewer

A 2. Focus Group Guide for Female Respondents

1. Greetings and introduction to the purpose of the study

how long the interview will last. Assuring respondents that their identity and confidentiality of responses will be protected. Explanation of the purpose of the recording equipment (video/audio recording).

2. Providing information about the project

My/our name is XXXXXX and we represent/represent an independent social consultant/consultants who carry out their activities in accordance with international standards. Wind Powerima, a 100 percent Georgian company that is implementing a 206 MW wind farm project in Kareli Municipality, asked us to study the socio-economic situation in the community in order to better understand the lifestyle of the communities living around any potential project. As part of this socio-economic research, we will meet people living or working in Kareli municipality, we will discuss various issues related to the social and economic situation of the community, such as the availability of communal services, land use, Access to jobs, vulnerability, access to education and social issues related to children. Your participation in the survey is very important and will help us create a realistic picture of local lifestyles and livelihoods.

Basic rules of focus discussion:

- Honest reactions and honest answers
- There are no "right" or "wrong" answers
- Speak fairly loudly and clearly
- Ask that cell phones be turned off
- The format of the conversation is informal and free
- Encourage respondents to share examples of their personal or other people's lives

3. Brief presentation of discussion respondents and warm-up questions

- Brief presentation: name, age, place of residence.

- What activities do people usually do in your community?
    - What part of community members are employed?
    - Where are they employed?
    - Are the community members employed according to their profession?

- Who has more employment opportunities, women or men? Why?
- Does the employment outlook vary with the seasons? how

- What kinds of jobs are available for women in your village?
  - What is the average wage for jobs available to community members?
  - What are the requirements for vacancies in your village?
  - Are the stated requirements realistic?
  - Do you meet these requirements?
  - Do other people in your community meet these requirements?
- Can women find work outside your community?
  - Where exactly can these jobs be found?
  - What kind of work can be found?
  - What are the requirements for jobs outside your village?
  - Are the stated requirements realistic?
  - Do you meet these requirements?
  - Do other people in your community meet these requirements?

- How do you define a high-paying job? What amount of money per month is considered a high salary per person?

- Let's talk about household needs:

  - Food - Do you think your family members are getting enough food (in terms of calories)? Do you think your family's diet is healthy? In your understanding, what does it mean to eat healthy food? Does food availability depend on the season? if so how?

    o Can you tell us the prices of some basic and important subsistence products? Do you buy or produce the above products yourself? Where do you buy these products? Are these products always available? Are these products expensive?

  - Medical Services - Are medical services available to you? What types of medical services are available in your area? Do you have to go to a regional center / capital to receive certain medical services? If so, why/which specific medical services do you have to travel for?

    - How satisfied are you with the medical services provided? why What would you like to change?
    - Are medicines available geographically/financially? Where can I buy these medicines?

  Education - are you satisfied with the level of educational institutions in your area (kindergarten / school / higher educational institution)? What are the main problems facing these institutions? What kind of measures can be taken to eliminate these problems? Who should be responsible for these measures?

  - Utilities - Are utilities available? Are you struggling to pay your utility bills? Are utilities expensive? Are you satisfied with the quality of this service? Why, or why not?
- Are there any employment assistance programs available for women? If so, which program specifically? Can you rate the effectiveness of the mentioned service? Please give an example.

- What are the main challenges you face in the job search process?

- Do you attend any training? What kind of training are you attending? where How useful was the knowledge gained at the said training? Did you get a job after this training?
  - o Has anyone in your community attended trainings? What is their experience?
- What is your attitude towards professional education? Why?
- Are members of your community involved in agriculture / animal husbandry / fishing? What proportion of people are involved in agricultural activities?
- Do the community members consume (subsistence level) or sell household products? How / where do they sell household products?

- Do you like living in your area? What do you think needs to change in your region? Who is responsible for these changes?
- Do you think you could live anywhere else? where What would be the determining factor for leaving your region?
- Are there places around your settlement that have a religious, spiritual/sacred or scientific purpose? Which places are religious? Holy? Scientific (historical, archaeological)? yet?

- How do you spend your free time? What activities do members of your community do in their free time? Do you and your community members gather in a special place? If so, where? Why?
- Perhaps you already know that a 206 MW wind power plant is planned to be built in the territory of Kareli / Gori municipality, do you think this project will affect your daily life? if so how why?
    - What can a construction company do to support your community?
- In your opinion, in what way can the cooperation between your community and the construction company of the above project be developed? What are the possible ways to condition this cooperation? Do you think this collaboration could be successful? Do you think your community could benefit from this collaboration? if so how?

- How would you assess the employment potential of the local population? o In your opinion, Is there enough local labor to carry out this project?
    - Where do you think it will be possible to employ local labor?
    - From your point of view, what can be done to develop the skills of the local workforce?
- Do you want to add anything?

Thank you for your time!

A 3. Focus Group Guide for SMEs

1. Greetings and introduction to the purpose of the study

how long the interview will last. Assuring respondents that their identity and confidentiality of responses will be protected. Explanation of the purpose of the recording equipment (video/audio recording).

2. Providing information about the project

My/our name is XXXXXX and we represent/represent an independent social consultant/consultants who carry out their activities in accordance with international standards. Wind Powerima, a 100 percent Georgian company that is implementing a 206 MW wind farm project in Kareli Municipality, asked us to study the socio-economic situation in the community in order to better understand the lifestyle of the communities living around any potential project. As part of this socio-economic research, we will meet people living or working in Kareli municipality, we will discuss various issues related to the social and economic situation of the community, such as the availability of communal services, land use, Access to jobs, vulnerability, access to education and social issues related to children. Your participation in the survey is very important and will help us create a realistic picture of local lifestyles and livelihoods.

3. Brief introduction of discussion participants and warm up

- Short introduction: Name, age, marital status, hobby;

- What are the most common services small and medium business in your area provide?
- What is the sector of the business that you are involved in?
    - How long have you been involved in this business?
    - Why particularly this sector? Is it demanded?
    - Is your business season? What do you do when the seasonal business is not active?
    - Who is the customer? Can people afford buying/suing your services?
    - Have you always been involved in this sector?
    - Do you have experience with other sectors as well?

- How would you assess the conditions for business development in your area? Why? Can you give examples (examples of conditions 10 and 5 years ago)
- What is the share of the residents of our area that are involved in the business?
    - Which sector are they involved in?
    - How many jobs do you personally create with your business?
- What are the difficulties for the business development you currently face? Please rank them by priority.
    - How these challenges can be addresses?
    - Who is responsible for addressing these challenges? What can the business representatives do to address these challenges? How
    - Did the challenges change over time? What were the challenges faced 10, 5 years ago? How were these challenges addressed?
- How do you assess the future of business development?
    - Which areas are the most promising?
    - Why particularly these areas?
- What hinders the development of SMEs?
- Have you used the services of banks or other institutions for credits?
    - Is this common?
    - Which lender is most common? Why?
- Have you used the state programs?
    - Which ones? Where did you learns regarding these? Is it easy to participate? Why?
    - Could you evaluate the effectiveness of the special government programs for SME development?
- Do you think large businesses operating in the same sector have impact on your business? How? What can be done to avoid this?
- You already might know that Deep-sea port project is planned to be implemented soon. Do you think it will affect your business? How? Why?
    - What can be done from the state of the developer company to support your business?
- Do you think there are ways to cooperate with the developer company? What are the possible ways of cooperation? Do you think the cooperation can be successful? Do you think you can benefit from the cooperation? How?
- How would you assess the employment potential of the local population?
    - Do you think local labor force is enough for the project?
    - Where do you think local workforce can be employed?
    - What do you think can be done in order to develop local workforce?
- What is your forecast regarding the development of your area?
- Would you like to add something?

Thank you for your time!

A 4. Focus Group Guide for Internally Displaced

Focus Group Guide for Internaly displaced Persons

1. Greetings and introduction to the purpose of the study

how long the interview will last. Assuring respondents that their identity and confidentiality of responses will be protected. Explanation of the purpose of the recording equipment (video/audio recording).

2. Providing information about the project

My/our name is XXXXXX and we represent/represent an independent social consultant/consultants who carry out their activities in accordance with international standards. Wind Powerima, a 100 percent Georgian company that is implementing a 206 MW wind farm project in Kareli Municipality, asked us to study the socio-economic situation in the community in order to better understand the lifestyle of the communities living around any potential project. As part of this socio-economic research, we will meet people living or working in Kareli municipality, we will discuss various issues related to the social and economic situation of the community, such as the availability of communal services, land use, Access to jobs, vulnerability, access to education and social issues related to children. Your participation in the survey is very important and will help us create a realistic picture of local lifestyles and livelihoods.

Basic rules of focus discussion:

- Honest reactions and honest answers
- There are no "right" or "wrong" answers
- Speak fairly loudly and clearly
- Ask that cell phones be turned off
- The format of the conversation is informal and free
- Encourage respondents to share examples of their personal or other people's lives

3. Brief presentation of discussion respondents and warm-up questions

- Brief presentation: name, age, place of residence.

- What activities do people usually do in your community?
    - What part of community members are employed?
    - Where are they employed?
    - Are the community members employed according to their profession?
    - Who has more employment opportunities, women or men? Why?
    - Does the employment outlook vary with the seasons? how
- What kinds of jobs are available for you and your community members in your village?
    - What is the average wage for jobs available to community members?

  - What are the requirements for vacancies in your village?
  - Are the stated requirements realistic?
  - Do you meet these requirements?
  - Do other people in your community meet these requirements?
- Can your community mambers (IDPs) find work outside your community?
  - Where exactly can these jobs be found?
  - What kind of work can be found?
  - What are the requirements for jobs outside your village?
  - Are the stated requirements realistic?
  - Do you meet these requirements?
  - Do other people in your community meet these requirements?
- How do you define a high-paying job? What amount of money per month is considered a high salary per person?
- Let's talk about household needs:
  - Food - Do you think your family members are getting enough food (in terms of calories)? Do you think your family's diet is healthy? In your understanding, what does it mean to eat healthy food? Does food availability depend on the season? if so how?
    - o Can you tell us the prices of some basic and important subsistence products? Do you buy or produce the above products yourself? Where do you buy these products? Are these products always available? Are these products expensive?
  - Medical Services - Are medical services available to you? What types of medical services are available in your area? Do you have to go to a regional center / capital to receive certain medical services? If so, why/which specific medical services do you have to travel for?
    - How satisfied are you with the medical services provided? why What would you like to change?
    - Are medicines available geographically/financially? Where can I buy these medicines?

Education - are you satisfied with the level of educational institutions in your area (kindergarten / school / higher educational institution)? What are the main problems facing these institutions? What kind of measures can be taken to eliminate these problems? Who should be responsible for these measures?

  - Utilities - Are utilities available? Are you struggling to pay your utility bills? Are utilities expensive? Are you satisfied with the quality of this service? Why, or why not?
- Are there any employment assistance programs available for IDPs? If so, which program specifically? Can you rate the effectiveness of the mentioned service? Please give an example.
- What are the main challenges you face in the job search process?
- Do you attend any training? What kind of training are you attending? where How useful was the knowledge gained at the said training? Did you get a job after this training?
  - o Has anyone in your community attended trainings? What is their experience?
- What is your attitude towards professional education? Why?
- Are members of your community involved in agriculture / animal husbandry / fishing? What proportion of people are involved in agricultural activities?
- Do the community members consume (subsistence level) or sell household products? How / where do they sell household products?

- Do you like living in your area? What do you think needs to change in your region? Who is responsible for these changes?
- Do you think you could live anywhere else? where What would be the determining factor for leaving your region?
- Are there places around your settlement that have a religious, spiritual/sacred or scientific purpose? Which places are religious? Holy? Scientific (historical, archaeological)? yet?
- How do you spend your free time? What activities do members of your community do in their free time? Do you and your community members gather in a special place? If so, where? Why?
- Perhaps you already know that a 206 MW wind power plant is planned to be built in the territory of Kareli / Gori municipality, do you think this project will affect your daily life? if so how why?
    - What can a construction company do to support your community?
- In your opinion, in what way can the cooperation between your community and the construction company of the above project be developed? What are the possible ways to condition this cooperation? Do you think this collaboration could be successful? Do you think your community could benefit from this collaboration? if so how?

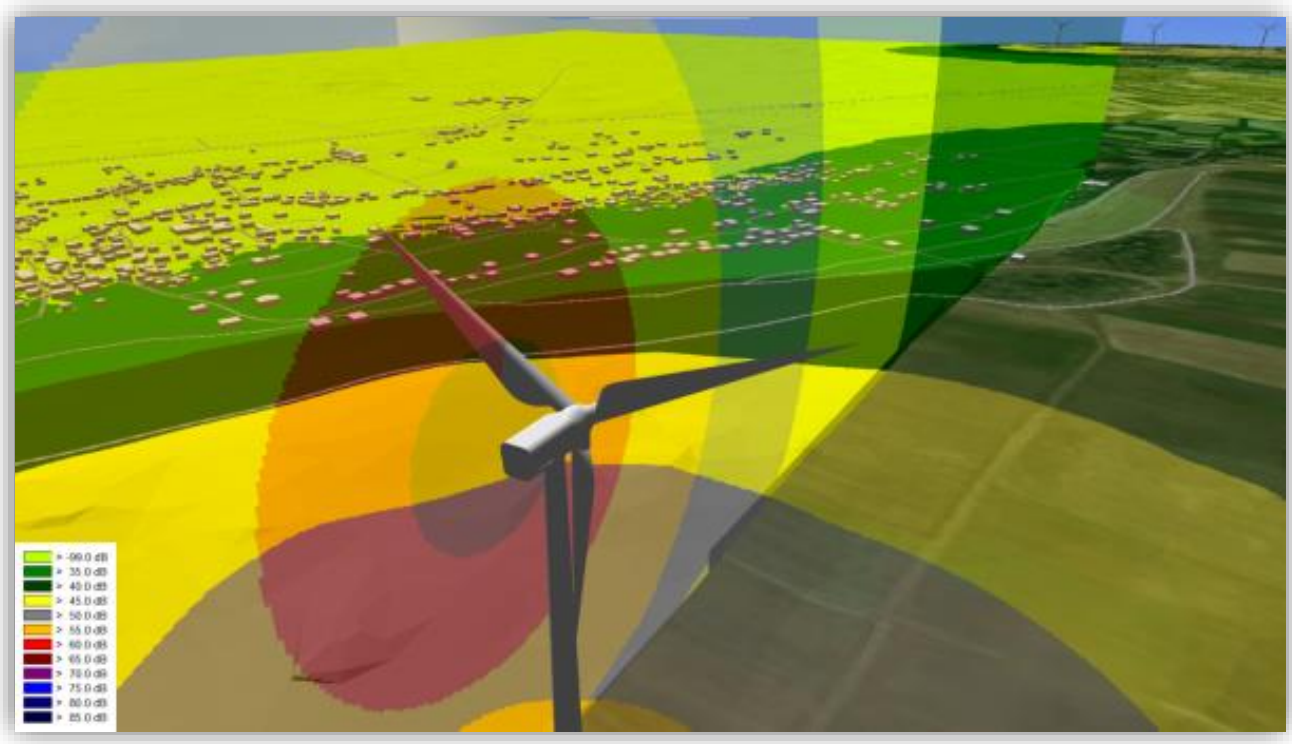
- How would you assess the employment potential of the local population? o In your opinion, Is there enough local labor to carry out this project?
    - Where do you think it will be possible to employ local labor?
    - From your point of view, what can be done to develop the skills of the local workforce?
- Do you want to add anything?

Thank you for your time!

Annex 7. Baseline Noise Measurements and Noise Impact Modeling

J.S.C. “Wind Power”

Ruisi Wind Farm Project



Noise Survey and Modeling Report

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Tbilisi
2022 Y.

Table of Contents

1. Principal Terms. Definitions

Term		Definition
Acoustic noise	-	All kinds of continuous, uncomfortable and disturbing sounds, elastic oscillations and waves in the air, which occur as a result of the actions of natural or legal persons and create discomfort; they may have a negative impact on a person's health or social status.
Vibration	-	Flexible oscillations and waves in a solid body
Sound	-	Mechanical (acoustic) oscillations perceived by a human hearing analyzer in 16 Hz - 20 kHz range.
Noise	-	Unfavorable sound, which creates discomfort, affects our auditory system and hampers the perception of desirable sounds.
Admissible noise level	-	The magnitude of the sound, which does not cause direct or indirect negative effects on a person, does not reduce his ability to work, does not negatively affect his feelings or mood, does not cause a substantial change in a functional system, which is sensitive to him.
Continuous noise	-	The sound measured by “Slow” time characteristic of the noise meter, which changes by no more than 5 dBA in time.
Intermittent noise	-	The sound measured by “Slow” time characteristic of the noise meter, which changes in time of no more than >5 dBA.
Background noise	-	Summary level of all signals, except the signals generated by the study source.
A weighting	-	The spectrum of noise sound frequency per ceptible for humanauditory system.
„IFC“	-	International Finance Corporation.
“WHO”	-	World Health Organization.

2. Introduction

City noise is a big problem for the world cities. Mobile sources account for 90% of noise propagation in Tbilisi and other cities of Georgia. Increasing number of the road vehicles contributes to an increased air, water and soil pollution, as well as physical pollution of the environment with noise and electromagnetic radiation. Particularly adverse environmental impacts of the road transport are obvious at the major vehicle concentration points (e.g., intersections, fleets, etc.). Due to the constant increase in the number of vehicles, the number of problems related to the vehicle fleets increase on a regular basis.

Road traffic noise has become a major concern of communities living in the vicinity of major highway corridors. It is causing more disturbances to people than any other sources. Moreover, this menace to health and quality of life has been increasing over the last two decades for number of reasons. The most important cause is of the number of road vehicles, and consequently, increases in the density of road traffic.

The construction of multi - lane motorways is going on at increasing rates in most developed countries and even in many developing nations during last few decades, allowing large volume of traffic to travel at a sustained speed. The next most important cause of noise on the roads is the speed of traffic. As a general rule, faster the traffic moves, greater is the volume of noise

Noise is particularly disturbing in the nearby residential, commercial and cultural areas. The noise level generated by vehicles depends on several factors, including: road condition, number of vehicles, traveling speed and intensity, ground conditions, characteristics of vehicles and building, time of the year, distance between the building and the road, weight of traveling vehicles, locations of traffic lights and intersections in the roads, etc.

The home owners usually complain about the noise when heavy equipment travels at different speeds along the roads near their houses or in the areas where vehicles are concentrated, as well as because of different plants giving out annoying noise.

Today's scientific and technological progress is characterized by increased production capacities, introduction of novel equipment, and intense technological processes. All these factors contribute to more intense acoustic vibrations at the plants, more noise, a disorderly combination of undesirable sounds of different frequencies and intensities, having an undesirable impact on the human body. The noise that develops at a plant varies unevenly over time, arises during production and causes unpleasant subjective feelings of the personnel.

Long-term and intensive noise exposure lead to certain changes in the human body, with their nature and intensity developing in stages. As a result of prolonged exposure to intense noise, both specific and general changes develop in the human body.

3. Project Description

This document is the noise study (modeling) report for the construction and operation project of 206 MW Ruisi wind power plant (Ruisi WPP) in Kareli and Gori municipalities of Shida Kartli Region. JSC "Wind Power" has planned to implement the project.

JSC "Wind Power" is a company with significant experience in developing the renewable energy sector in the country. JSC "Wind Power" is implementing Ruisi wind PP project in the area defined by the Memorandum of Understanding signed with the Government of Georgia on August 10, 2021. According to a preliminary assessment of wind, the location of Ruisi wind PP is favorable to instal 50 wind turbine generators with the total installed capacity of 206 MW.

The following types of benefits are expected to gain after the construction of Ruisi wind WPP:

- Development of the country's energy supply system; improving power supply reliability;
- Increasing local energy generation and reducing dependence on imports; promoting energy security and energy independence;
- Development of renewable energy sources, diversification of energy sources;
- Reduction of CO_2 emissions;
- Involvement of local contractors in the construction of wind power plants;
- Employment of local population in the operation of the wind power plant;
- Improvement of local infrastructure.

Under the project, Ruisi wind power plant will generate a total of 206 MW of electricity; the average installed capacity of each turbine is 4.2 MW. Fifty sites have been selected to install the turbines. Noise impacts will be assessed for the worst case scenario implying the installation of 50 turbines with an installed capacity of 4.2 MW. In reality, the impact will be less, as the specific turbine models will actually be determined based on the most favorable bid identified during the tender. In order to generate the allowed 206 MW, the final configuration of Ruisi WPP will incorporate several turbine generators with less than 4.2 MW, or alternatively, their number will be less than 50. Both, the reduced capacity and number of the turbine generators leads to the reduced impact intensity. Therefore, the preliminary assessment of the noise impact is provided for the worst case scenario.

4. Goals and Objectives

Within the scope of the given Project, the assignment of "Eco-Spectri" Ltd. was to identify major sensitive receptors along the project corridor and to evaluate the noise impact level caused by the Turbine on the receptors by using noise propagation 3D modeling method. It was necessary to evaluate noise impact level after the project implementation. As necessary, the consultant had to develop mitigation measures.

In order to accomplish the assignment, the consultant had to do the following actions:

- Analyze input information for modeling (Digital terrain model; Turbine Characteristics; Meteorology conditions of study area and e.t.c);
- Identify sources and noise levels at source;
- Identify sensitive receptors in the vicinity of the project area;
- Provide 3D modeling of noise propagation, taking into account all aspects of the environment;
- 3D modeling of noise propagation;
- If necessary, develop mitigation measures.

5. Environmental qualitative characteristic - Noise

5.1 Introduction

Noise is any unwanted sounds or a combination of sounds of different frequencies and intensities that have an undesirable influence on a human body.

With its physics, noise is the mechanical oscillations of particles of an elastic environment (gas, liquid, organic matter) within the scope of a human auditory analyzer (16 Hz-20 kHz) arising under the influence of a certain force. At the same time, the sound is called regular periodic (sinusoidal) oscillations, and the noise is called an irregular set of sounds, non-periodic, random oscillation processes. Thus, from a hygienic point of view, noise is a combination of sounds of different frequencies and levels of sounds, which hampers the perception of useful audible signals (music, conversation,

etc.) and triggers an unwanted, irritating effect on the human body. Noise is classified depending on the nature of spectrum and time characteristics.

5.2 Noise Sources

Depending on the place of origin, the noise sources are classified as follows:

- The main source of noise in the houses in the urban areas is mainly the traffic with the highest share in noise pollution. The number of cars, their speed, urban development and motor system are the main parameters that impact the noise distribution. Besides, a great share of heavy vehicles in the common car park is noteworthy;
- Engineering, technological and household equipment, as well as human activities are the internal noise sources in the houses;
- Sources related to human life activities, such as playing sports, cleaning the area, etc., within the framework of the micro-district (quarter);
- The external sources are industrial and energy infrastructure.

5.3 Time Characteristics of noise

Depending on time characteristics, the following types of noise can be identified:

A. Permanent noise: with its sound level changing by no more than 5 dB during an 8-gour working day in the working zone or in the rooms of residential and public buildings, as measured by a “slow” time property of the noise meter;
B. Non-permanent noise: with its level during an 8-gour working day in the working zone, or during the working shift or on the territory of the settled areas changes by more than 5 dB, as measured by a “slow” time property of the noise meter.

Non-permanent noise is classified as:

a. Noise varying in time, with its sound level continuously changing in time;
b. Intermittent noise, with its sound level changing gradually (by 5 dB or more). Besides, the duration of intervals, during which the noise level is permanent, is 1 second and more;
c. Pulse noise, which is made up of several sound signals with the duration of less than 1 sec. besides, the sound levels as measured by relevant time characteristic “impulse” and “slow” differ by no less than 7 dB.

6. Regulatory Requirements for Admissible Noise Impacts and Impact Assessment

As per the state standards, the admissible noise levels are specified by Decree # 297/N of the Ministry of Health, Labor and Social Affairs of Georgia. This Decree sets both admissible noise levels and maximum admissible levels for different territories (State Registration Code 470.230.000.11.119.004.920).

The noise levels in the buildings and premises and adjoining areas are also regulated by Technical Regulation no. 398 of the Government of Georgia on August 15, 2017 “On the levels of acoustic noise in the rooms of the residential houses and public establishments and their accommodation areas”. The given technical regulation, which is based on the requirements of the international standards (e.g. ISO 1996-1: 2003. “Acoustics, Description, measurement and assessment of environmental noise”, Part 1: “Main assessment values and procedures”; ISO 1996-2: 2007“Acoustics, description and measurement of environmental noise”, Part 2) sets the admissible levels of acoustic noise in the rooms of residential, buildings and buildings of public and in the settled areas to protect people against the unfavorable impact of noise.

The requirements of the Georgian and international legislations are identical except some minor changes.

Table N6.1: Georgian Standards for Noise Levels

Receptor	Time interval	Average admissible noise level (dB)	Maximum admissible noise level (dB)
Residential	7:00-23:00	55	70
Residential	23:00- 7:00	45	60
Commercial	24 hours	60	75

Table N6.2: IFC Noise Level Guidelines

Receptor	One hour Laeq (dB)	
	During the day 07.00-22.00	At night 22.00 – 07.00
Residential; institutional; educational	55	45
Industrial; commercial	70	70

For the technical regulation purposes (expert assessment of noise level), the rated parameter of continuous noise is the sound level measured by noise meter LAdBA with weighting A, and the equivalent sound level LAeqvdBA for non-continuous (variable) noise.

As per the given technical regulation, the admissible noise levels are given in table N6.3.

Table N6.3: Admissible levels of acoustic noise in the rooms of residential and public buildings and their settled areas

№	Purpose/use of area and premises	Allowable limits		
		LDay (dBA)		LNight (dBA)
		Day	Night	
1	Educational facilities and library halls	35	35	35
2	Medical facilities/chambers of medical institutions	40	40	40
3	Living quarters and dormitories	35	30	30
4	Hospital chambers	35	30	30
5	Hotel/motel rooms	40	35	35
6	Trading halls and reception facilities	55	55	55
7	Restaurant, bar, cafe halls	50	50	50
8	Theatre/concert halls and sacred premises	30	30	30
9	Sport halls and pools	55	55	55
10	Small offices (≤100m3) – working rooms and premises without office equipment	40	40	40
11	Big offices (≥100 m3) working rooms and premises without office equipment	45	45	45
12	Conference halls /meeting rooms	35	35	35

№	Purpose/use of area and premises	Allowable limits		
		LDay (dBA)		LNight (dBA)
		Day	Night	
13	areas bordering with houses residential, medical establishments, social service and children facilities(<6 storey buildings)	50	45	40
14	Areas bordering with houses residential, medical establishments, social service and children facilities(>6 storey buildings)	55	50	45
15	The areas bordering with hotels, trade, service, sport and public organizations	60	55	50

Note:

1. in case noise generated by indoor or outdoor sources is impulse or tonal, the limit must be 5dBA less than indicated in the table.

2. Acoustic noise limits given above are set for routine operation conditions of the 'space', i.e. windows and door are closed (exception – built-in ventilation canals), ventilation, air conditioning, lighting (in case available) are on; functional (baseline) noise (such as music, speech) not considered.

The results of noise measurements are documented in accordance with the rules established by the effective law. The noise level value of is calculated with 1 dBA accuracy, by considering generally accepted rounding of the value.

For workplace noise the following IFC standards are applicable.

Table N6.4: IFC Work Environment Noise limits

Type of Work, workplace	IFC General EHS Guidelines
Heavy Industry (no demand for oral communication)	85 Equivalent level Laeq, 8h
Light industry (decreasing demand for oral communication)	50 - 65 Equivalent level Laeq, 8h

IFC Requirements for noise impact assessment:

ENVIRONMENTAL, HEALTH, AND SAFETY GUIDELINES FOR WIND ENERGY August 7, 2015:
Noise impact should be assessed in accordance with the following principles:

- Receptors should be chosen according to their environmental sensitivity (human, livestock, or wildlife).
- Preliminary modeling should be carried out to determine whether more detailed investigation is warranted. The preliminary modeling can be as simple as assuming hemispherical propagation (i.e., the radiation of sound, in all directions, from a source point). Preliminary modeling should focus on sensitive receptors within 2,000 meters (m) of any of the turbines in a wind energy facility.
- If the preliminary model suggests that turbine noise at all sensitive receptors is likely to be below an LA90 of 35 decibels (dB) (A) at a wind speed of 10 meters/second (m/s) at 10 m height during day and night times, then this preliminary modeling is likely to be sufficient to assess

noise impact; otherwise it is recommended that more detailed modeling be carried out, which may include background ambient noise measurements.

- All modeling should take account of the cumulative noise from all wind energy facilities in the vicinity having the potential to increase noise levels.
- If noise criteria based on ambient noise are to be used, it is necessary to measure the background noise in the absence of any wind turbines. **This should be done at one or more noise-sensitive receptors.** Often the critical receptors will be those closest to the wind energy facility, but if the nearest receptor is also close to other significant noise sources, an alternative receptor may need to be chosen.
- The background noise should be measured over a series of 10-minute intervals, using appropriate wind screens. At least five of these 10-minute measurements should be taken for each integer wind speed from cut-in speed to 12 m/s

7. Baseline Measurements

7.1 Used Measuring Devices

The consulting organization used the equipment of the Polish company "SVANTEK", "SVAN 971" series for measuring noise (Figure N7.1, N7.2).

SVAN 971 series Sound Level Meters by Polish Svantek are appliances with Class 1 IEC 61672-1:2013 accuracy, capable of storing up to 100000 records. SVAN 971 offers a wide range of results in all needed weighting filters (A, C, Z), as well as 1/1 and 1/3 Octave spectra. SVAN 971 Sound Level Meter allows gaining most resultant noise units: Lpeak, Lmax, Lmin, L, Leq, LE, Lden, LEPd, Ltm3, Ltm5, Leq statistics (Ln), expected Leq value (EX), standard Leq deviation (SD), measurement time and overload time % (OVL), etc. SVAN 971 software allows developing graphical, table or text results of the accomplished measurements. The noise meter can store the received signals in internal memory and describe each signal according to level and date stamp. The device has a wind protective cap reducing the impact of environmental conditions (wind, temperature) during recording.

As per the International Finance Corporation, the noise level must be measured by using the 1st or 2nd class noise meter meeting the requirements of the guideline of the “International Electrotechnical Committee”. As per the same guideline, the noise monitoring is possible to provide with the aim to identify the existing background noise level of the environment adjacent to the design or existing facility or to examine the noise level in the operation phase.

Figure N7.1: “SVAN” 971 Sound Level Meter

Figure N7.2: Organization - owned noise meter

Noise meter configurations during the study were:

- Noise measurement range: 30-130 dB;
- Noise meter response speed: Slow (1 second);
- Frequency weighting: A.

- Type of mycrophone: 0.5" (12.7 mm.) el. Condensator.

7.2 Selection of Points and Conducted Measurement

The identified receptors sensitive to noise impacts are dwelling houses and residential zones, as well as potential commercial zones. No sensitive ecological receptors (habitats, animal and bird breeding or nesting sites etc.) are located within the project area. Thus the noise impact assessment was focused on potential impacts on the residential sites.

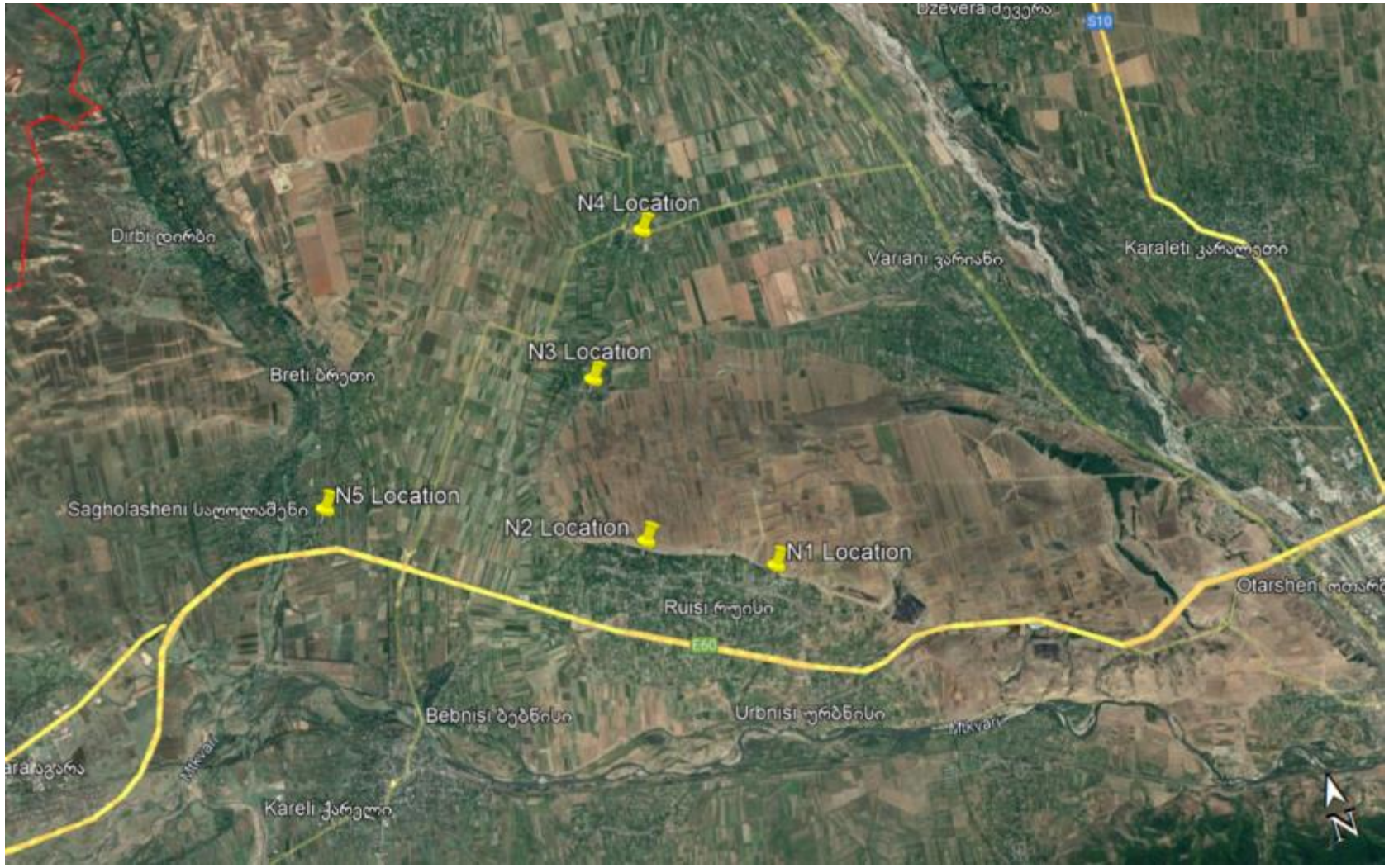
The baseline measurements were performed on the area of the residential buildings adjacent to the project wind farm. Before the onset of the study, the examination laboratory service of the Consultation Company developed a study plan. The study of the project wind farm buffer revealed several sensitive areas, where it was advisable to carry out the measurements (namely, villages Ruisi, Sasireti, Sakasheti and Sagolasheni). For each measurement the measurement locations were selected, which are the nearest residential buildings adjacent to the turbines (construction and operation sites).

The measurement was performed from 2022/09/17 to 2022/09/18. The noise measurement was performed continuously for 24 hours. Baseline noise measurements were performed at 5 locations adjacent to the project wind farm: these locations represent the dwelling houses closest to the turbines (IFC regulations recommend one or more sites for baseline studies).

The following sites were selected as measurement locations (See Figs. N7.2.1):

Noise Measurement
N1 - Vill. Ruisi
N2 - Vill. Ruisi
N3 - Vill. Sasireti
N4 - Vill. Sakasheti
N5 - Vill. Sagolasheni

Figure: N7.2.1: Noise Measurement Locations



Below are the GPS coordinates of the measurement locations (WGS/UTM/Zone 38):

- Noise N1 - Vill. Ruisi - X 415387 Y 4654055;
- Noise N2 - Vill. Ruisi - X 413427 Y 4655080;
- Noise N3 - Vill. Sasireti - X 413407 Y 4657939;
- Noise N4 - Vill. Sakasheti - X 414983 Y 4660133;
- Noise N5 - Vill. Sagolasheni - X 408432 Y 4657174;

The measurement process was not affected by any weather conditions (rain, wind). The air temperature during the measurements was as follows:

- 2022/09/17 - 24 ºC - Relative humidity 41%.[5]
- 2022/09/18 - 23 ºC - Relative humidity 42%.[6]

The baseline levels of noise was measured in line with the requirements of Georgian Legislation and the methodology and procedures developed by the Company. The baseline measurement was performed to identify the levels of baseline noise.

See Appendix N1 for conducted measurements photos. For the average values of the conducted measurements see in Table N7.2.1.

Table N7.2.1: Result of measurements

Measurement Parameter			Value	Source of Noise
Noise dBA	Norm of Georgian legislation (Adjacent to Residential house)	Day	55	Baseline
		Night	45	
	Result - N1 Point	Day	40	
		Night	36	
	Result - N2 Point	Day	43	
		Night	38	
	Result - N3 Point	Day	43	
		Night	32	
	Result - N4 Point	Day	48	
		Night	36	
	Result - N5 Point	Day	48	
		Night	46	

As it can be seen from the obtained results, the recorded noise level for all five locations are below the admissible daily noise levels established by the Georgian legislation or international regulations (e.g. IFC noise standards).

The night noise levels recorded by the measurements, with the exception of location N5 (village Sagolasheni), are below the night noise levels established by the Georgian legislation. At location (point) N5, the noise level during the night was 46 dBA what is 1 dB higher than the night noise norm.

[5] Source - http://meteo.gov.ge/.
[6] Source - http://meteo.gov.ge/.

The background noise at this sampling point is mostly associated with the highway noise, as the site is located close to the highway and there are no noise barriers between the road and the village.

The highest noise level during the measurements was recorded at points N4 and N5 making 48 dBA. In both cases the highest noise level was recorded during the day.

Persons responsible for the measurements:

Archil Revazishvili	**David Kaviladze**
LTD "Eco-Spectri" **Signature**	**LTD "Eco-Spectri"** **Signature**
Head of Examination Laboratory	**Senior specialist of Environmental and Social issues**

7.3 Tabular results of measurements

The tables below show the results of the baseline noise measurement for 5 locations. The tables show both, the hourly and daytime and nighttime noise levels.

N1 Measurement		
Date	Location	Distance from the Nearest Turbine
17/09/2022 - 18/09/2022	Vill. Ruisi	1000 m.
N1 Measurement Results		
Average	Day (08:00-23:00)	Night (23:00-08:00)
	40	36
Hourly		
1	2022/09/17 - 18:00 - 19:00	38,2
2	2022/09/17 - 19:00 - 20:00	40,9
3	2022/09/17 - 20:00 - 21:00	38,7
4	2022/09/17 - 21:00 - 22:00	38,8
5	2022/09/17 - 22:00 - 23:00	38,3
6	2022/09/17 - 23:00 - 24:00	34,9
7	2022/09/18 - 00:00 - 01:00	35,9
8	2022/09/18 - 01:00 - 02:00	35,5
9	2022/09/18 - 02:00 - 03:00	35,2
10	2022/09/18 - 03:00 - 04:00	33,4
11	2022/09/18 - 04:00 - 05:00	33,8
12	2022/09/18 - 05:00 - 06:00	35,3

N1 Measurement		
13	2022/09/18 - 06:00 - 07:00	36,2
14	2022/09/18 - 07:00 - 08:00	39,4
15	2022/09/18 - 08:00 - 09:00	38,6
16	2022/09/18 - 09:00 - 10:00	39,3
17	2022/09/18 - 10:00 - 11:00	43,8
18	2022/09/18 - 11:00 - 12:00	40,3
19	2022/09/18 - 12:00 - 13:00	40,4
20	2022/09/18 - 13:00 - 14:00	41,4
21	2022/09/18 - 14:00 - 15:00	38,2
22	2022/09/18 - 15:00 - 16:00	38
23	2022/09/18 - 16:00 - 17:00	40,4
24	2022/09/18 - 17:00 - 18:00	41

N2 Measurement		
Date	Location	Distance from the Nearest Turbine
17/09/2022 - 18/09/2022	Vill. Ruisi	600 m.
N2 Measurement Results		
Average	Day (08:00-23:00)	Night (23:00-08:00)
	43	38
Hourly		
1	2022/09/17 - 18:00 - 19:00	40,9
2	2022/09/17 - 19:00 - 20:00	41,5
3	2022/09/17 - 20:00 - 21:00	46,6
4	2022/09/17 - 21:00 - 22:00	47,2
5	2022/09/17 - 22:00 - 23:00	44,9
6	2022/09/17 - 23:00 - 24:00	38
7	2022/09/18 - 00:00 - 01:00	37,6
8	2022/09/18 - 01:00 - 02:00	38,6
9	2022/09/18 - 02:00 - 03:00	36,4
10	2022/09/18 - 03:00 - 04:00	34,5
11	2022/09/18 - 04:00 - 05:00	34,1
12	2022/09/18 - 05:00 - 06:00	39
13	2022/09/18 - 06:00 - 07:00	42,1
14	2022/09/18 - 07:00 - 08:00	42,5
15	2022/09/18 - 08:00 - 09:00	41,4
16	2022/09/18 - 09:00 - 10:00	41,8
17	2022/09/18 - 10:00 - 11:00	41,9

N2 Measurement		
18	2022/09/18 - 11:00 - 12:00	43,2
19	2022/09/18 - 12:00 - 13:00	44,3
20	2022/09/18 - 13:00 - 14:00	42,5
21	2022/09/18 - 14:00 - 15:00	42
22	2022/09/18 - 15:00 - 16:00	42
23	2022/09/18 - 16:00 - 17:00	42,2
24	2022/09/18 - 17:00 - 18:00	42,7

N3 Measurement		
Date	Location	Distance from the Nearest Turbine
17/09/2022 - 18/09/2022	Vill. Sasireti	600 m.
N3 Measurement Results		
Average	Day (08:00-23:00)	Night (23:00-08:00)
	43	32
Hourly		
1	2022/09/17 - 18:00 - 19:00	41,2
2	2022/09/17 - 19:00 - 20:00	39,8
3	2022/09/17 - 20:00 - 21:00	39
4	2022/09/17 - 21:00 - 22:00	38,7
5	2022/09/17 - 22:00 - 23:00	39,1
6	2022/09/17 - 23:00 - 24:00	33,7
7	2022/09/18 - 00:00 - 01:00	32,7
8	2022/09/18 - 01:00 - 02:00	31,7
9	2022/09/18 - 02:00 - 03:00	28,8
10	2022/09/18 - 03:00 - 04:00	28,6
11	2022/09/18 - 04:00 - 05:00	28,7
12	2022/09/18 - 05:00 - 06:00	28,7
13	2022/09/18 - 06:00 - 07:00	32,6
14	2022/09/18 - 07:00 - 08:00	38,2
15	2022/09/18 - 08:00 - 09:00	43,1
16	2022/09/18 - 09:00 - 10:00	41
17	2022/09/18 - 10:00 - 11:00	44,4
18	2022/09/18 - 11:00 - 12:00	48,5
19	2022/09/18 - 12:00 - 13:00	45,5
20	2022/09/18 - 13:00 - 14:00	48,9
21	2022/09/18 - 14:00 - 15:00	46
22	2022/09/18 - 15:00 - 16:00	43,4

N3 Measurement		
23	2022/09/18 - 16:00 - 17:00	43,2
24	2022/09/18 - 17:00 - 18:00	41

N4 Measurement		
Date	Location	Distance from the Nearest Turbine
17/09/2022 - 18/09/2022	Vill. Sakasheti	700 m.
N4 Measurement Results		
Average	Day (08:00-23:00)	Night (23:00-08:00)
	48	36
Hourly		
1	2022/09/17 - 18:00 - 19:00	55
2	2022/09/17 - 19:00 - 20:00	51,6
3	2022/09/17 - 20:00 - 21:00	49,4
4	2022/09/17 - 21:00 - 22:00	42
5	2022/09/17 - 22:00 - 23:00	36,2
6	2022/09/17 - 23:00 - 24:00	34,5
7	2022/09/18 - 00:00 - 01:00	39,6
8	2022/09/18 - 01:00 - 02:00	44,9
9	2022/09/18 - 02:00 - 03:00	40,5
10	2022/09/18 - 03:00 - 04:00	31,7
11	2022/09/18 - 04:00 - 05:00	31
12	2022/09/18 - 05:00 - 06:00	32,9
13	2022/09/18 - 06:00 - 07:00	37
14	2022/09/18 - 07:00 - 08:00	36
15	2022/09/18 - 08:00 - 09:00	41,1
16	2022/09/18 - 09:00 - 10:00	44,4
17	2022/09/18 - 10:00 - 11:00	47,9
18	2022/09/18 - 11:00 - 12:00	46,2
19	2022/09/18 - 12:00 - 13:00	49,3
20	2022/09/18 - 13:00 - 14:00	53,9
21	2022/09/18 - 14:00 - 15:00	51,8
22	2022/09/18 - 15:00 - 16:00	48,4
23	2022/09/18 - 16:00 - 17:00	46,4
24	2022/09/18 - 17:00 - 18:00	53

N5 Measurement		
Date	Location	Distance from the Nearest Turbine
17/09/2022 - 18/09/2022	Vill. Sagolasheni	600 m.
N5 Measurement Results		
Average	Day (08:00-23:00)	Night (23:00-08:00)
	48	46
Hourly		
1	2022/09/17 - 18:00 - 19:00	49,1
2	2022/09/17 - 19:00 - 20:00	50,3
3	2022/09/17 - 20:00 - 21:00	49,9
4	2022/09/17 - 21:00 - 22:00	50,7
5	2022/09/17 - 22:00 - 23:00	48
6	2022/09/17 - 23:00 - 24:00	47,9
7	2022/09/18 - 00:00 - 01:00	48,4
8	2022/09/18 - 01:00 - 02:00	45,2
9	2022/09/18 - 02:00 - 03:00	45,6
10	2022/09/18 - 03:00 - 04:00	43,1
11	2022/09/18 - 04:00 - 05:00	42,9
12	2022/09/18 - 05:00 - 06:00	44,7
13	2022/09/18 - 06:00 - 07:00	46,7
14	2022/09/18 - 07:00 - 08:00	49,2
15	2022/09/18 - 08:00 - 09:00	45,8
16	2022/09/18 - 09:00 - 10:00	44
17	2022/09/18 - 10:00 - 11:00	41,8
18	2022/09/18 - 11:00 - 12:00	45,7
19	2022/09/18 - 12:00 - 13:00	47,5
20	2022/09/18 - 13:00 - 14:00	47,4
21	2022/09/18 - 14:00 - 15:00	47,2
22	2022/09/18 - 15:00 - 16:00	47,5
23	2022/09/18 - 16:00 - 17:00	49
24	2022/09/18 - 17:00 - 18:00	48,7

7.4 Conclusion of Baseline Measurements

Based on the agreement, Representatives of the “Eco-Spectri“-’s Examination Laboratory performed instrumental measurements of baseline noise levels at residential buildings adjacent to the project site. These residential buildings are closest to the planned turbine sites.

The baseline measurements were performed on the area of the residential buildings adjacent to the project wind farm.

The measurement was performed from 2022/09/17 to 2022/09/18.

As it can be seen from the obtained results, the recorded noise level for all five locations are below the admissible daily noise levels established by the Georgian legislation and international regulations (e.g. IFC standards).

The night noise levels recorded by the measurements, with the exception of location N5 (village Sagolasheni), are below the night noise levels established by the Georgian legislation. At location (point) N5, the noise level during the night was 46 dBA what is 1 dB higher than the night noise norm. The background noise at this sampling point is mostly associated with the highway noise, as the site is located close to the highway and there are no noise barriers between the road and the village.

The highest noise level during the measurements was recorded at points N4 and N5 making 48 dBA. In both cases the highest noise level was recorded during the day.

8. Noise 3D Modeling

8.1 General

To identify the degree of environmental impact and to subsequently manage it in the design and construction phases of the infrastructural facility, a swift study of the environmental characteristics as well as the identification of the capacity and levels of such impacts is important. Noise modeling allows evaluating the noise distribution characteristics in the construction and operation phases of the Turbines and noise impact levels in the study area and nearest settlement before the project is implemented.

Based on the received data, the implementing agency will have an opportunity to take noise preventive measures what will have a positive impact on the population of nearby settlements, as well as on the turbines efficiency.

Noise modeling is a complex job giving a great importance to the modeling data. Consequently, the obtained results immediately depend on the complete input data. Below we give a brief description of noise modeling:

- A detailed study of the turbine noise characteristics is done at the initial stage;
- The data on the characteristics of the environment adjacent to the turbines are collected (Relief, landscaping, settlements, sensitive receptors, etc.);
- The initial modeling data are retrieved and processed according to the characteristics of a concrete study object;
- The compliance of the technical requirements and instructions for noise propagation with respect to a specific source is determined;
- The noise level is calculated at any study point by using relevant computer software;
- The efficiency of the obtained results and modeling is examined;
- A report on the obtained results is developed for further assessment of the noise impact level.

8.2 Modeling Initial Information

8.2.1 Used Computer Software

Noise modeling was performed using a German-made “CadnaA” computer program. “CadnaA” is a worldwide accepted software for noise modelling and is a leading tool used in ESIA studies for infrastructure projects. The software algorythms are matched with the “Calculation standard - „ISO 9613 - Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation“.

“CadnaA” (Computer Aided Noise Abatement) is the leading software for calculation, presentation, assessment and prediction of environmental noise. Whether your objective is to study the noise emission of an industrial plant, of a mart including a parking lot, of a new road or railway scheme or even of entire towns and urbanized areas: “CadnaA” is designed to handle all these tasks.

With more than 30 implemented standards and guidelines, powerful calculation algorithms, extensive tools for object handling, outstanding 3D visualization and the very user-friendly interface “CadnaA” is the perfect software to handle national and international noise calculation and noise mapping projects of any size.

With its technical capabilities and its ease of use “CadnaA” represents state-of-the-art technology. “CadnaA” is developed in C/C++ and communicates perfectly with other Windows applications like word processors, spreadsheet calculators, CAD software and GIS-databases. “CadnaA” includes a multi-lingual user interface and is successfully applied in more than 60 countries all over the world.

8.2.2 Resources used in modeling

The following works were accomplished within the scope of noise modeling:

- The noise sources and characteristics were identified;
- The design points were selected along the border of the area to protect;
- The direction of noise propagation was specified from the sources of noise to the design points was specified and the acoustic calculations of the environment were done which have an impact on noise propagation (natural screens, green plantings, etc.);
- The expected noise levels were identified at the design points and compared to the admissible noise level.

Modeling configuration:

- Distances of the modeled sections 12000 x 11500 m.
- Area Coordinates (UTM/WGS84/Meridian 38):
  - Bottom left corner X - 407396, Y - 4651046;
  - Upper right corner X - 419527, Y - 4662883;
- Receiver Interval 10x10 m.
- Max search radius 2000 m.

The following information was used for modeling:

1. Project location plan (ShapeFiles);
2. Project turbine characteristics (height, work schedule, etc.);
3. Typical noise levels (dBA) for each source (source - technical specifications of the equipment and literature materials);
4. Digital Terrain Model (ASTER GDEM);
5. Environmental conditions of the study area (green plants, noise-suppressing structures, barriers, etc.);
6. Attributes of the nearest buildings;
7. Meteorological properties;
8. Calculation standard - „ISO 9613 - Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation“;
9. Standard for noise source characteristics - „ISO 11203:1995 - Acoustics - Noise emitted by machinery and equipment - Determination of emission sound pressure levels at a work station and at other specified positions from the sound power level“;
10. Noise norms provided by the legislation of Georgia.

8.3 Calculation standard - „ISO 9613”

This noise modeling is based on ISO 9613, regarding Attenuation of Sound during Propagation Outdoors. The standard contains calculation methods of sound attenuation during propagation outdoors. The purpose is to estimate noise level of environment at a point generated from various noise sources.

Attenuation occurring when noise waves are propagated outdoor may be in the form of attenuation due to distances (divergence) from sound sources to observation points, attenuation due to atmospheric absorption, attenuation due to ground effects, attenuation due to objects blocking the propagation of sounds, etc.

Basic equation of noise pressure on the receiver point is:

$$L_{ft} = L_w + D_c - A$$

$$A = A_{div} + A_{atm} + A_{gr} + A_{bar} + A_{misc}$$

By:

L_w - Power level of noise source;

D_c - Directivity factor of noise source;

A - Attenuation (octave band);

A_{div} - Attenuation due to distance (divergence);

A_{atm} - Attenuation due to atmospheric absorption;

A_{gr} - Attenuation due to ground effects;

A_{bar} - Attenuation due to barriers;

A_{misc} - Attenuation due to other effects, such as the presence of trees, (forests), the presence of industrial areas or residential areas.

8.3.1 Attenuation due to distance (Geometrical divergence A_{div})

Attenuation due to distance is calculated by using the following equation:

$$A_{div} = [20Log(\frac{d}{d_o}) + 11]\ dB$$

By:

d - the distance from the source to the observation point;

d_o - reference distance (in general = 1 meter).

8.3.2 Attenuation due to atmospheric absorption A_{atm}

Attenuation due to atmospheric absorption is calculated by using the following equation:

$$A_{atm} = \frac{\alpha d}{1000}$$

α is the coefficient atmospheric attenuation (in dB/km units), for every octave band. Examples o α coefficient is presented in Table 8.3.2.1.

Table 8.3.2.1: Example of atmospheric attenuation coefficient

Temperature	Relative Humidity	Atmospheric attenuation coefficient α, dB/km							
		Frequency, Hz							
°C	%	63	125	250	500	1000	2000	4000	8000
10	70	0.1	0.4	1.0	1.9	3.7	9.7	32.8	117
20	70	0.1	0.3	101	2.8	5.0	9.0	22.9	76.6
30	70	0.1	0.3	1.0	3.1	7.4	12.7	23.1	59.3
15	20	0.3	0.6	1.2	2.7	8.2	28.2	88.8	202
15	50	0.1	0.5	1.2	2.2	4.2	10.8	36.2	129
15	80	0.1	0.3	1.1	2.4	4.1	8.3	23.7	82.8

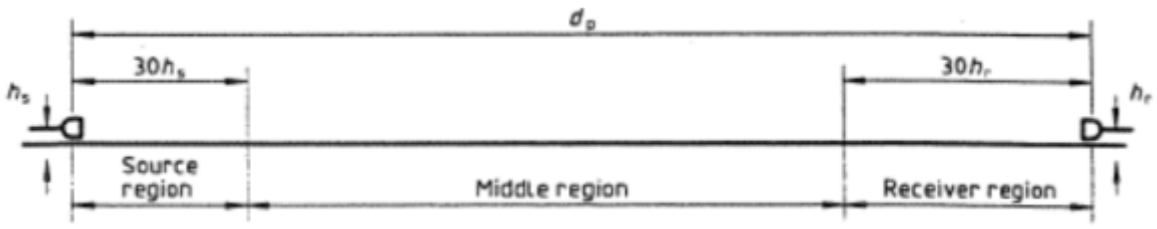
8.3.3 Attenuation due to ground effects (A_{gr})

Attenuation due to the largest ground effect is caused by sound reflections from the ground surface experiencing interference with sound directly propagating from the source to the receiver.

To calculate the attenuation, three areas are defined at the sound propagation track, namely:

- The source area, is the area located between the source to a distance of $30h_s$ with a maximum distance of d_p. h_s is the source height and d_p is the propagation distance from the source to the receiver.
- The receiver area, is the area located between the receiver to a distance of $30h_r$ with a maximum distance of d_p. h_r is the receiver height and d_p is the propagation distance from the source to the receiver.
- The middle area, is the area located between the source area and the receiver area. If $d_p < (30h_s + 30h_r)$, the source area and receiver area will overlap, accordingly there is no middle area.

Figure 8.3.3.1: Division of areas to determine attenuation due to ground effects



Apart from that, the ground surface of each area is categorized into:

- **Hard ground**, including cement covered surfaces, tiles, water, ice, concrete and other surfaces with low porosities. For hard surfaces, G=0.
- **Porous ground or porous surfaces,** including grass covered surfaces, trees and other vegetation, and soil surfaces that are usually used for the growth of vegetation, such as rice fields. For porous surfaces, G=1.
- **Mixed ground**. If the ground surface is a combination of hard surfaces and porous surfaces, then the G value varies from 0 to 1.

To calculate the surface attenuation, the attenuation in the A_s source should be calculated by calculating the G_s surface factor, the attenuation in the A_p receiver area by calculating the G_p surface factor and the attenuation in the A_m middle area by calculating the G_m surface factor by using Table 8.3.3.1 Then the attenuation due to the ground effect is calculated by using the following equation:

$$A_{gr} = A_s + A_r + A_m$$

Table 8.3.3.1: Equation to calculate the ground effect attenuation at the source, receiver and middle areas

Frequency Hz	A_s or A_r [1] dB	A_m dB
63	-1,5	$-3q$ [2]
125	$-1.5 + G \times a'(h)$	$-3q(1-G_m)$
250	$-1.5 + G \times a'(h)$	
500	$-1.5 + G \times a'(h)$	
1000	$-1.5 + G \times a'(h)$	
2000	$-1.5 + (1-G)$	
4000	$-1.5 + (1-G)$	
8000	$-1.5 + (1-G)$	

Notes

$a'(h)=1.5 + 3.0 \times e^{-0.12(h-5)^2}(1-e^{-dp/50}) + 5.7 \times e^{-0.09h^2}(1-e^{-2.8\times10^{-6} \times dp^2})$

$b'(h)=1.5 + 8.6 \times e^{-0.09h^2}(1-e^{-dp/50})$

$c'(h)=1.5 + 14.0 \times e^{-0.46h^2}(1-e^{-dp/50})$

$d'(h)=1.5 + 5.0 \times e^{-0.9h^2}(1-e^{-dp/50})$

1) To calculate A_s, $G=G_s$ and $h=h_s$ are used. To calculate A_r, $G=G_r$ and $h=h_r$ are used.
2) $q=0$, if $d_p O (30h_s + 30h_r)$
   $q=1-(30*(h_s+h_r)/d_p)$, if $d_p > (30h_s + 30h_r)$

In specific conditions, namely:

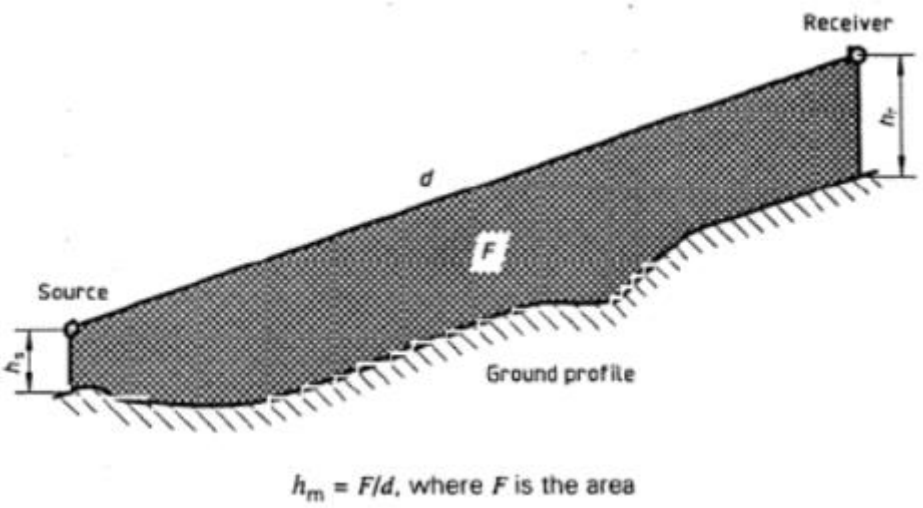
- If only the sound pressure at the receiver position is calculated;
- If the sound propagation occurs in areas with porous surfaces or mixed ground that are mostly porous surfaces;
- If propagated sounds are not pure tones.

Then the attenuation is calculated by using the following equation:

$$A_{gr} = 4.8 - (2h_m / d)\left[17 + (300/d)\right] \geq 0 \quad dB$$

h_m is the average height of the propagation track on the ground surface (meter) and *d* is the distance between the source and the receiver position (see Figure 8.3.3.2).

Figure 8.3.3.2: Method to evaluate h_m



$h_m = F/d$, where F is the area

In the calculation of attenuation due to ground effect, the ground surface in the surroundings of project zone is considered to be a porous surface as the ground surface is covered by grass, trees and other vegetation. The impedance effect due to the ground surface is calculated by using the following equation:

$$P \sim R^{-b}$$

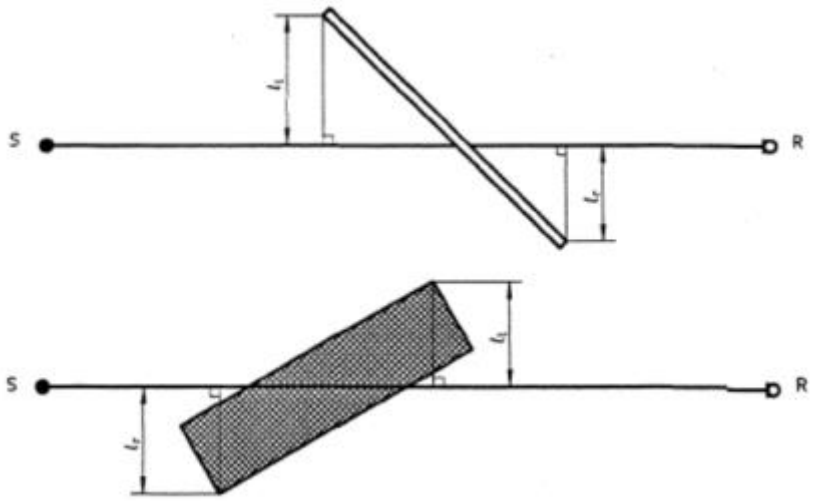
R is the propagation distance, while b is the impedance effect factor of the ground surface. For ground surfaces covered with grass, the b=1,2 value is used.

8.3.4 Attenuation due to barriers (A_{bar})

An object is referred to as a barrier if:

- The surface density is at least 10 kg/m^2;
- The object surface is covered without any cracks or gaps;
- The object height from the propagation surface is greater than the octave band (l_l+l_r >λ) wavelength as indicated in Figure 8.3.4.1.

Figure 8.3.4.1: Cross-section of two objects/barriers in the propagation track



Diffraction effects occurring at the upper end of the barrier is calculated by using the following equation:

$$A_{bar} = D_z - A_{gr} > 0$$

While diffraction effects that occur around the vertical ends are calculated by using the following equation:

$$A_{bar} = D_z > 0$$

D_z is the attenuation barrier for each octave band frequency, that is calculated with the following equation:

$$D_z = 10Log\left[3 + \left(C_2 / \lambda\right) C_3 z K_{met}\right] \quad dB$$

With:

C2 = 20, inclusive the reflection factor due to the ground effect. If the reflection factor due to the ground effect is calculated separately, C2 = 40.

C3 = 1 for a single diffraction. For a double diffraction, C3 = $[1+(5\lambda/e)^2]/[(1/3)+(5\lambda/e)^2]$

λ - wavelength for each octave band;

z - difference between the propagation track length of direct sounds and diffracted sounds;

K_{met} - correction factor for meteorology effects;

e - distance between two diffraction ends when double diffraction occur.

8.3.5 Meteorological correction

Meteorological corrections are calculated by using the following equation:

$$C_{met} = 0,\ jika\ d_p \le 10(h_s + h_r)$$

$$C_{met} = C_0\left[1 - 10(h_s + h_r)/d_p\right],\ jika\ d_p > 10(h_s + h_r)$$

8.3.6 Other attenuations (A_{misc})

Other attenuations calculated are attenuations due to the presence of trees, attenuations due to industrial areas and attenuations due to housing areas.

Attenuations due to the presence of forests A_{fol}

The presence of trees can cause attenuation if the density of the trees actually blocks the propagation track. The attenuation size due to the trees is indicated in Table 8.3.6.1 Attenuation due to the presence of forests can also be calculated by using the following equation:

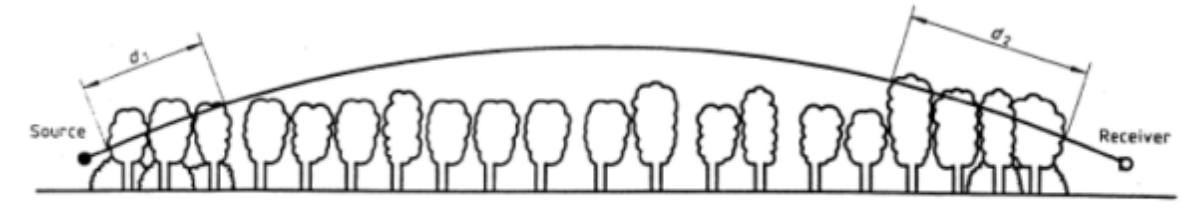
$$A_{fol} = [8.5 + 0.12d]\ \ dB$$

d is the diameter of the forest/foliage.

Table 8.3.6.1: Sound attenuation during propagation at d_f distance, through trees

Propagation distance d_f, meter	Frequency, Hz							
	63	125	250	500	1000	2000	4000	8000
10 O df O 20	Attenuation , dB:							
	0	0	1	1	1	1	2	3
20 O df O 200	Attenuation , dB/m:							
	0.02	0.03	0.04	0.05	0.06	0.08	0.09	0.12

Figure 8.3.6.1: Attenuation A_{fol} increases linear towards the d curve length, passing trees/forests



NOTE — $d_f = d_1 + d_2$

For calculating d_1 and d_2, the curved path radius may be assumed to be 5 km.

Attenuation due to the presence of industrial areas A_{site}

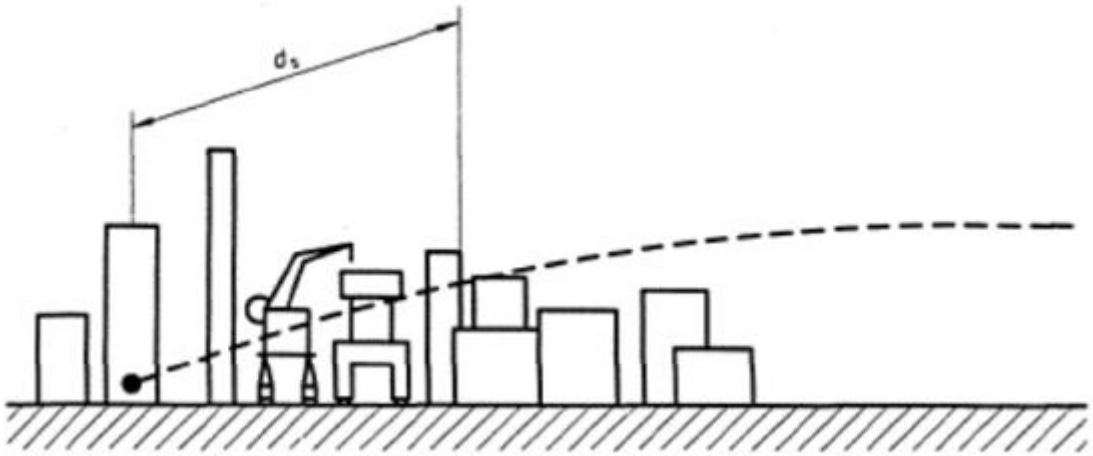
In industrial areas, attenuation may occur due to the scattering of the installation of equipment and other objects in industrial areas. The attenuation size highly depend on the type of the site and the

equipment, therefore accurate attenuation are largely determined by measuring. Table 8.3.6.2 is an estimate of the attenuation size due to the presence of industries. The attenuation size increases linear against the d curve, along the equipment (see Figure 8.3.6.2), with a maximum attenuation of 10 dB.

Table 8.3.6.2: Estimated sound attenuation size due to the presence of industrial areas

Frequency, Hz	63	125	250	500	1000	2000	4000	8000
A_{site}, dB/m	0	0.015	0.025	0.025	0.02	0.02	0.015	0.015

Figure 8.3.6.2: Attenuation A_{site} increases linear against the d curve length in industrial areas



<u>Attenuation due to housing areas A_{hous}</u>

The presence of housing areas in the surroundings of the source, receiver and the sound propagation track may contribute to cause attenuation due to the blocked propagation of the sound source. The size of the attenuation A_{hous} is highly dependent on the actual condition, therefore the calculation of A_{hous} is basically an estimated value. Mathematical equations used to calculate A_{hous} are:

$$A_{hous} = A_{hous,1} + A_{hous,2}$$

$$A_{hous,1} = 0.1Bd_b \quad dB$$

$$A_{hous,2} = -10Log\left[1-\left(p/100\right)\right] \quad dB$$

With:

$A_{hous,2}$ - is calculated when there are rows of buildings near roads, railways and other corridors;

B - density of buildings or housings along the propagation track, i.e. the area with buildings divided by the total outer area;

d_b - the total length of the propagation track is calculated similarly to the procedure in Figure 8.3.6.2;

p - the percentage of the façade length is relative against the total length of the roads or railways.

8.4 Noise Receptors

The project area is located in Gori and Kareli Municipalities. There are villages near the locations of the project turbines. Therefore, the major sensitive receptors found near the study area are buildings and facilities used temporarily or permanently by the local population.

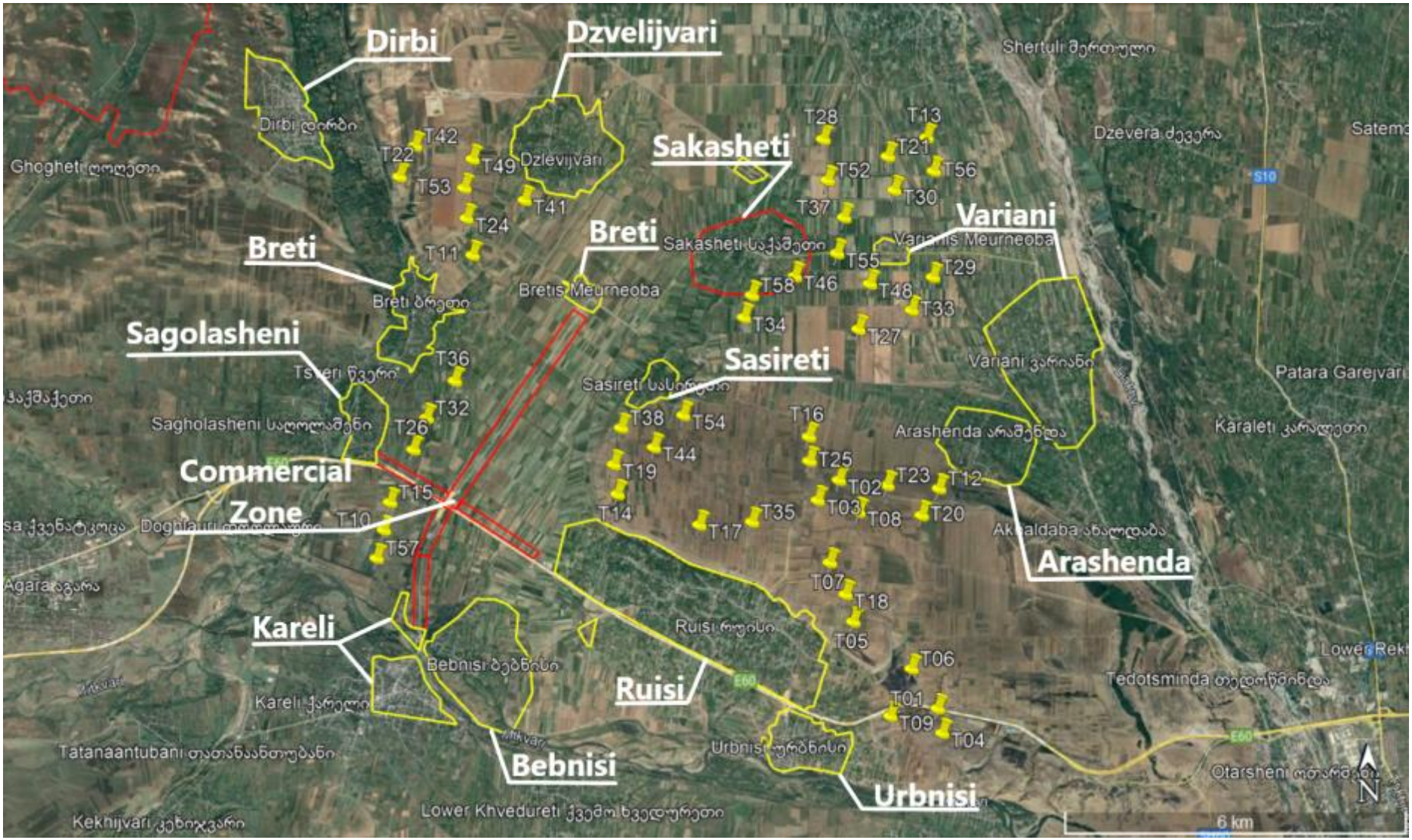
Villages adjacent to the project area are as follows:

- Vill. Ruisi;
- Vill. Sagolasheni;
- Vill. Breti;
- Vill Bretis Meurneoba
- Vill. Sasireti;
- Vill. Dirbi;
- Vill. Dzvelijvari;
- Vill. Sakasheti;
- Vill. Variani;
- Vill. Varianis Meurneoba
- Vill. Arashenda.
- Vill. Urbnisi;
- Vill. Bebnisi;
- Kareli.

Of the listed villages, Ruisi is outstanding in terms of population (5139 people based on 2014 census).

Figure N8.4.1 below shows the locations of the turbines and adjacent villages.

Figure N8.4.1: Settlements adjacent to the project area



8.5 Noise Modeling Scenarios

Construction Phase

The dominant source of noise from most construction equipment is the engine, usually a diesel, without sufficient muffling. Only in a few cases noise generated by the process dominates (for example, impact pile driving, pavement breaking).

The internal combustion engines of different power are used to provide propulsion for the wheels of trucks and/or operating power for the working mechanisms such as buckets, dozers, etc. Exhaust noise is usually the most important component of internal combustion engine noise. However, noise associated with the air intake, cooling fans, and the mechanical and hydraulic transmission and control systems may also be significant, depending upon the type and size of specific pieces of equipment.

Noise levels during construction will vary depending on the activity, type and number of equipment, work schedule, duration of use and the distance from receptor. Construction in this analysis, first the noise level due to each piece of equipment, which is likely to be used in the construction, is calculated.

Noise levels induced by the main road construction equipment considered in assessment are presented in Table below (Note: the values indicated in the table may differ depending on the brand of machinery provided/used by contractor). The list includes all equipment except vehicles and some minor pieces of equipment.

Construction Equipment	Typical noise level (dBA)[7]
Mobile crane	73 - 79
Bulldozer	81.7
Excavator	80.7
Grader	85
Roller	80.0
Rock Drill	81.0
Dump Truck	76.5
Concrete Mixer Truck	78.8
Dump Truck	76.5
Dump Truck	76.5
Paver	77.2
Boring Jack Power Unit	83.0

[7] The noise levels is given near the source of noise.

Noise modeling for the construction phase admits that 2 neighboring wind turbines will be installed at the same time. Modeling assumes that during the construction, two construction machines, each with the noise level of 95 dB, will work at each location simultainiously.

Noise modeling for construction phase was done for the worst case scenario, with all sources (four macines at two neighboring sites) operating simultaneously.

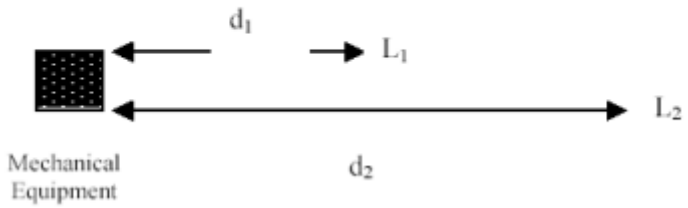
In sound modeling, at construction phase, area source is used as noise source.

Area sources are modelled as closed polygons. They are noise sources extending in two dimensions while the third dimension perpendicular to its area is small in relation to the receiver distance. CadnaA subdivides upon calculation the area sources into sufficiently smallsub-areas. In the centre of each sub-source a point source with the appropri-ate partial sound power is placed. This procedure results in a fine grid ofpoint sources, the total emission of which represents the area source.

Horizontal area sources are inserted by entering their horizontal projection. Examples of area sources are construction sites, parking lots, sports facilities, and even entire industrial or commercial areas.

The noise level L_2 (in dBA) at distance d_2 can be computed from the noise level L_1 (in dBA) measured at distance d_1 by the equation:

$$L_2 = L_1 - 20 \log (d_2 / d_1)$$



Operation Phase

Noise modeling was done for the turbine construction and operation scenario and for the worst case scenario with simultaneous operation of all turbines. A total of 50 wind turbines will be operating simultaneously in the operation phase.

Noise modeling for the construction phase admits that 2 wind turbines will be installed at the same time. Modeling assumes that during the construction, two construction machines, each with the noise level of 95 dB, will work at each location.

Below we give all noise modeling scenarios:

- Scenario N1 - wind turbine construction scenario;

- Scenario N2 - wind turbine operation scenario:
  - Turbine cabin height - 105 m;
  - Turbine cabin height - 150 m.

The point source of noise in the operation phase is the turbine cabin, which is, in first case 105-meter high and in second case 150-meter high. The spectral levels of the wind turbine noise source in the operation phase are given in Table N8.5.1.

Table N8.5.1: Noise Levels of Wind Turbines

Turbine Model	Noise Level L_{WAf} [dB]								
	31.5	63	125	250	500	1000	2000	4000	8000
Generic WTG 4MW planform	73.1	84.3	92.9	98.5	102.4	102.6	98.1	95.7	80.8

Noise modeling for both, the construction and operation phases, was done for the worst case scenario, with all sources operating simultaneously. A vertical grid with the height of 500 meters was used to demonstrate spherical noise propagation. Consequently, it is possible to determine the noise impact level on birds.

The calculation was done for the option of operating of noise sources with a maximum load. For noise suppression, the computer software considered the possibility of noise loss by considering sound absorption of the atmosphere (under the influence of temperature, humidity and atmospheric pressure) and distance to the source. This method is based on the noise propagation characteristics and guidelines given in ISO 9613 (Acoustics - Attenuation of sound during propagation outdoors — Part 2: General method of calculation).

The air temperature during the modeling is 20°C, while the relative humidity is 70%. The turbines operate 24 hours a day.

9. Noise Modeling Results

As the obtained results evidence, in the wind turbines operation phase, the level of noise caused by the wind turbine operation will not exceed 40 dBA at the nearest building found in village Arashenda (in both scenario (105 m. and 150 m.)). This noise level is lower than the day and night noise standards established by the legislation of Georgia.

In the wind turbines operation phase, the level of noise caused by the wind turbine operation will not exceed 40 dBA at the nearest building found in village Breti (in both scenario (105 m. and 150 m.)). This noise level is lower than the day and night noise standards established by the legislation of Georgia.

In the wind turbines operation phase, the level of noise caused by the wind turbine operation will not exceed 42 dBA at the nearest building found in village Variani (in both scenario (105 m. and 150 m.)). This noise level is lower than the day and night noise standards established by the legislation of Georgia.

In the wind turbines operation phase, the level of noise caused by the wind turbine operation will not exceed 42 dBA at the nearest building found in village Ruisi (in both scenario (105 m. and 150 m.)). This noise level is lower than the day and night noise standards established by the legislation of Georgia.

In the wind turbines operation phase, the level of noise caused by the wind turbine operation will not exceed 40 dBA at the nearest building found in village Sasireti (in both scenario (105 m. and 150 m.)).

This noise level is lower than the day and night noise standards established by the legislation of Georgia.

In the wind turbines operation phase, the level of noise caused by the wind turbine operation will not exceed 41 dBA at the nearest building found in village Sagholasheni (in both scenario (105 m. and 150 m.)). This noise level is lower than the day and night noise standards established by the legislation of Georgia.

In the wind turbines operation phase, the level of noise caused by the wind turbine operation will not exceed 40 dBA at the nearest building found in village Dzvelijvari (in both scenario (105 m. and 150 m.)). This noise level is lower than the day and night noise standards established by the legislation of Georgia.

In the wind turbines operation phase, the level of noise caused by the wind turbine operation will not exceed 43 dBA at the nearest building found in village Sakasheti (in both scenario (105 m. and 150 m.)). This noise level is lower than the day and night noise standards established by the legislation of Georgia.

Noise modeling results for the wind turbines construction phase are given for the nearest residential houses in village Sakasheti, which are located closest the two turbines. The noise level at the nearest building in case of simultaneous installation of two turbines will not exceed 40 dBA. This noise level is lower than the day and night noise standards established by the legislation of Georgia.

Overall, as the modeling results have evidenced, the noise level generated in the construction and operation phases of the wind turbines at the nearest residential buildings does not exceed the day and night noise standards established by the legislation of Georgia.

It should be considered that all calculations above were made for the case of simultaneous operation of all noise sources.

Table N9.1: Noise impact levels at a vertical height of 150 meters

Distance From The Turbine	Noise Level (dBA)
50 m.	63.5
100 m.	56.3
200 m.	50.3
500 m.	41.8

Table N9.2 below shows the expected noise levels for buildings in the nearest settlements. Noise levels are presented for two scenarios: Turbine cabin height - 105 m. and Turbine cabin height - 150 m.

Table N9.2: Noise levels at nearest receptors

Settlement	Building N	Building Coordinates		Noise Levels (dBA)	
		X	Y	Turbine cabin height - 105 m.	Turbine cabin height - 150 m.
Arashenda	1	418539	4656529	37.8	38.1
	2	418510	4656543	37.9	38
Breti	1	411970	4659983	30.2	30.1
	2	411826	4659789	30.1	30
Variani	1	417182	4660427	41.3	41.2
	2	417629	4660222	40.8	40.7
Ruisi	1	413630	4655011	40	40.1
	2	415896	4653996	41.8	41.7
Sasireti	1	413402	4657947	39.7	39.6
	2	413232	4657925	39.6	39.5
Sagolasheni	1	408508	4657331	40.8	40.7
Dzvelijvari	1	411319	4661676	39.2	39.1
	2	410821	4662101	39.1	39
Sakasheti	1	414975	4659905	42.8	42.7
	2	415192	4660090	42.4	42.2
Kareli	1	408805	4654484	39.2	39.1
	2	408777	4654394	38.5	38.4
Bebnisi	1	409525	4653893	29.8	29.7
	2	409495	4653841	29.7	29.6
Urbnisi	1	416427	4651982	37.8	37.7
	2	416477	4651887	38	37.9

As can be seen from Table N9.2, as a result of the change in the height of the turbines (105 m. and 150 m.), the noise levels on the nearest residential buildings change insignificantly. The maximum difference observed as a result of modeling is 0.3 dBA.

Noise modeling is also performed in the commercial zone adjacent to the project area (See figure N8.4.1). As the modeling results showed, as a result of the operation of the WPP (under both scenarios), the noise levels within the commercial zone do not exceed 55 dBA. In the section of the commercial zone, which is closest to the area where the stations are located, the noise level is 52 dBA. In all other cases, noise levels are much lower (ranging from about 40-45 dBA).

Since the permissible norm of noise for commercial / industrial purpose buildings is 60 dBA according to the national legislation, exceeding the permissible norm of noise in the mentioned area is not fixed as a result of modeling.

Figures N9.1 - N9.27 below show the visual modeling results of noise propagation caused by the WPP construction and operation (for all scenarios). **The borders of the villages are shown as the contures were confirmed by the municipal authorities and they include all residential houses and areas, which could be used as residential in future (e.g. the development zone in Sakasheti village). Thus modeling covers all residential houses and areas, which are under the potential noise impact**.

Figure N9.1: Initial view of the project area

Figure N9.2: Initial view of the project area

Figure N9.3: Propagation of noise in the vicinity of Arashenda village - Turbine Height - 105 m.

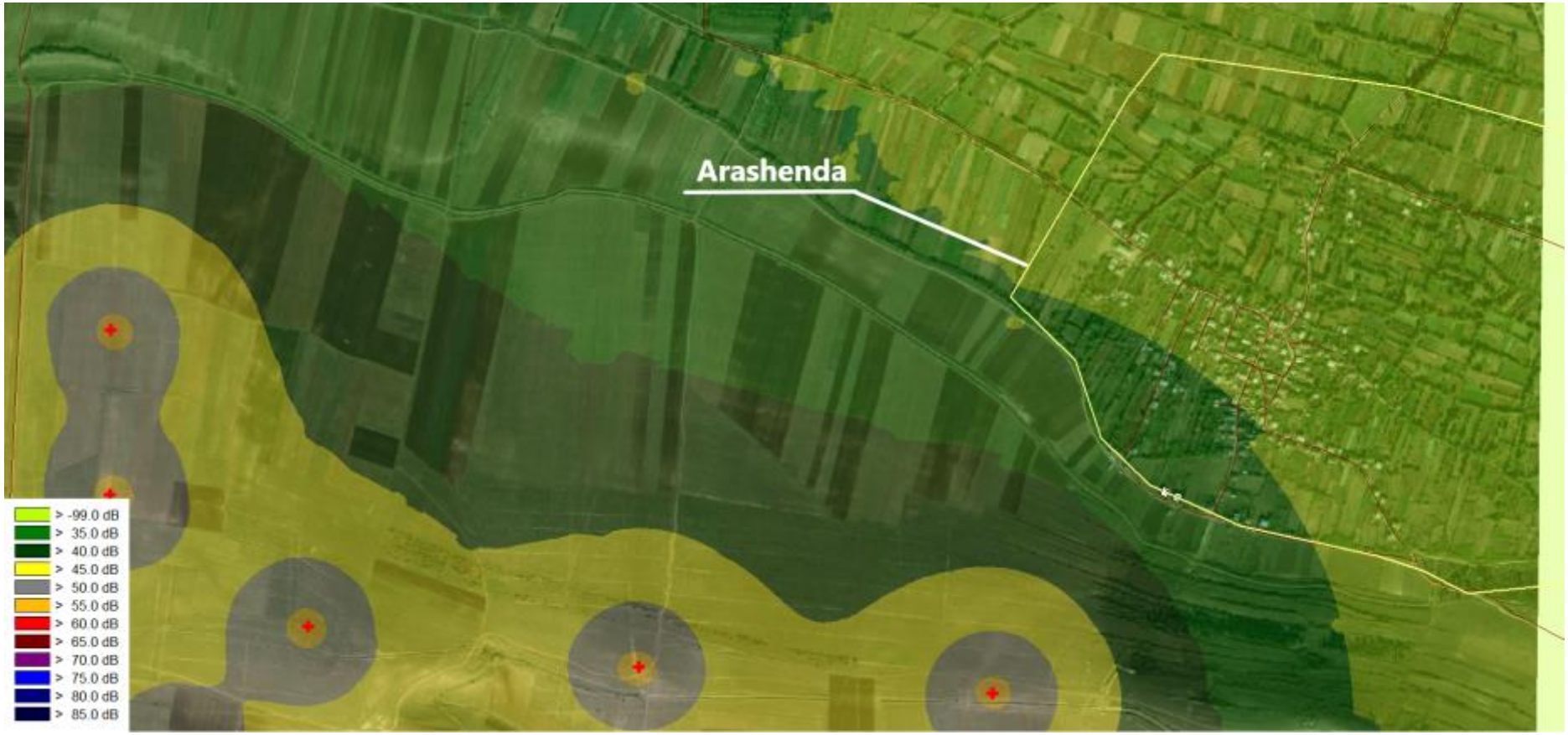


Figure N9.4: Propagation of noise in the vicinity of Breti village and Breti Meurneoba - Turbine Height - 105 m.

Figure N9.5: Propagation of noise in the vicinity of Variani village and Variani Meurneoba - Turbine Height - 105 m.

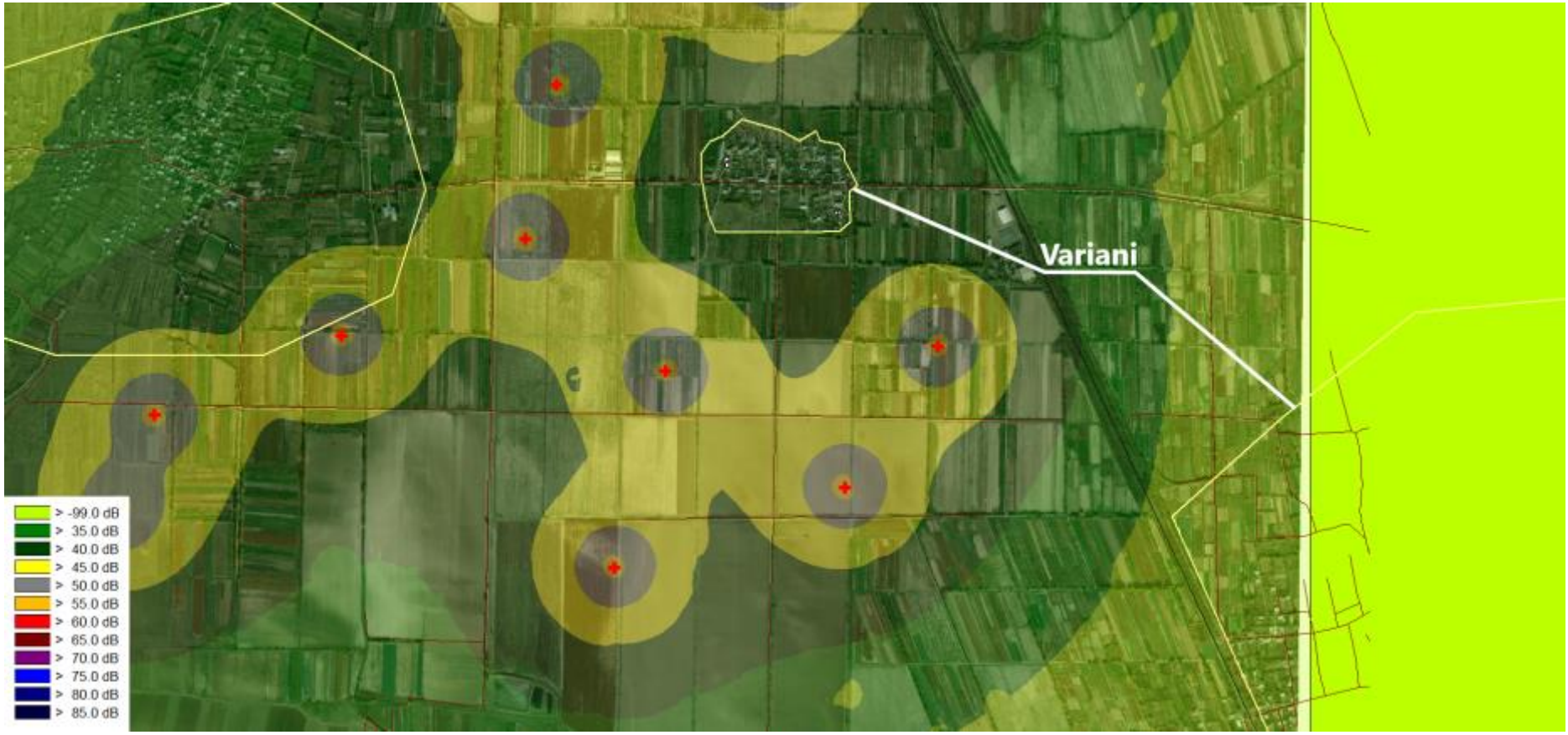


Figure N9.6: Propagation of noise in the vicinity of Ruisi village - Turbine Height - 105 m.

Figure N9.7: Propagation of noise in the vicinity of Sasireti village - Turbine Height - 105 m.

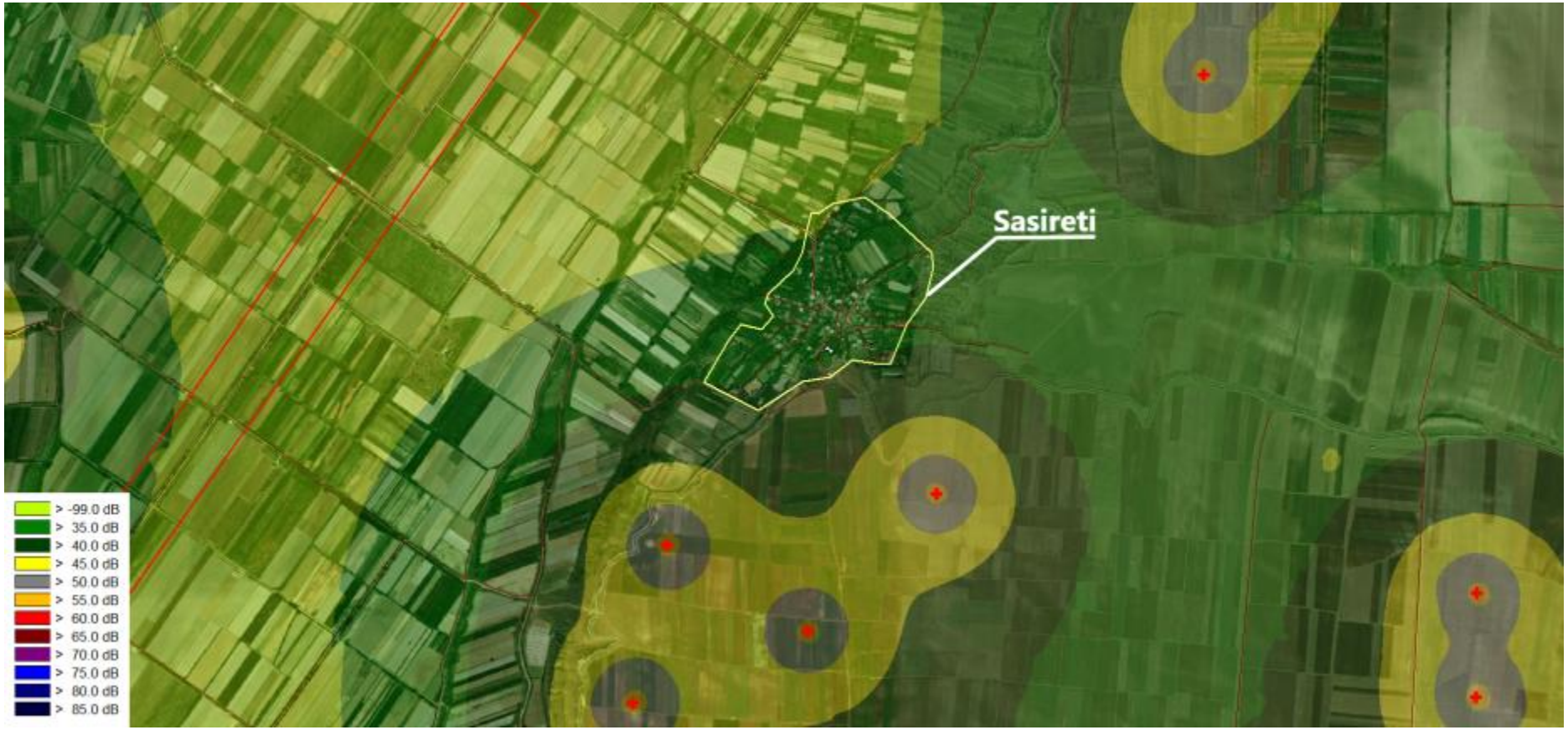


Figure N9.8: Propagation of noise in the vicinity of Sakasheti village - Turbine Height - 105 m.

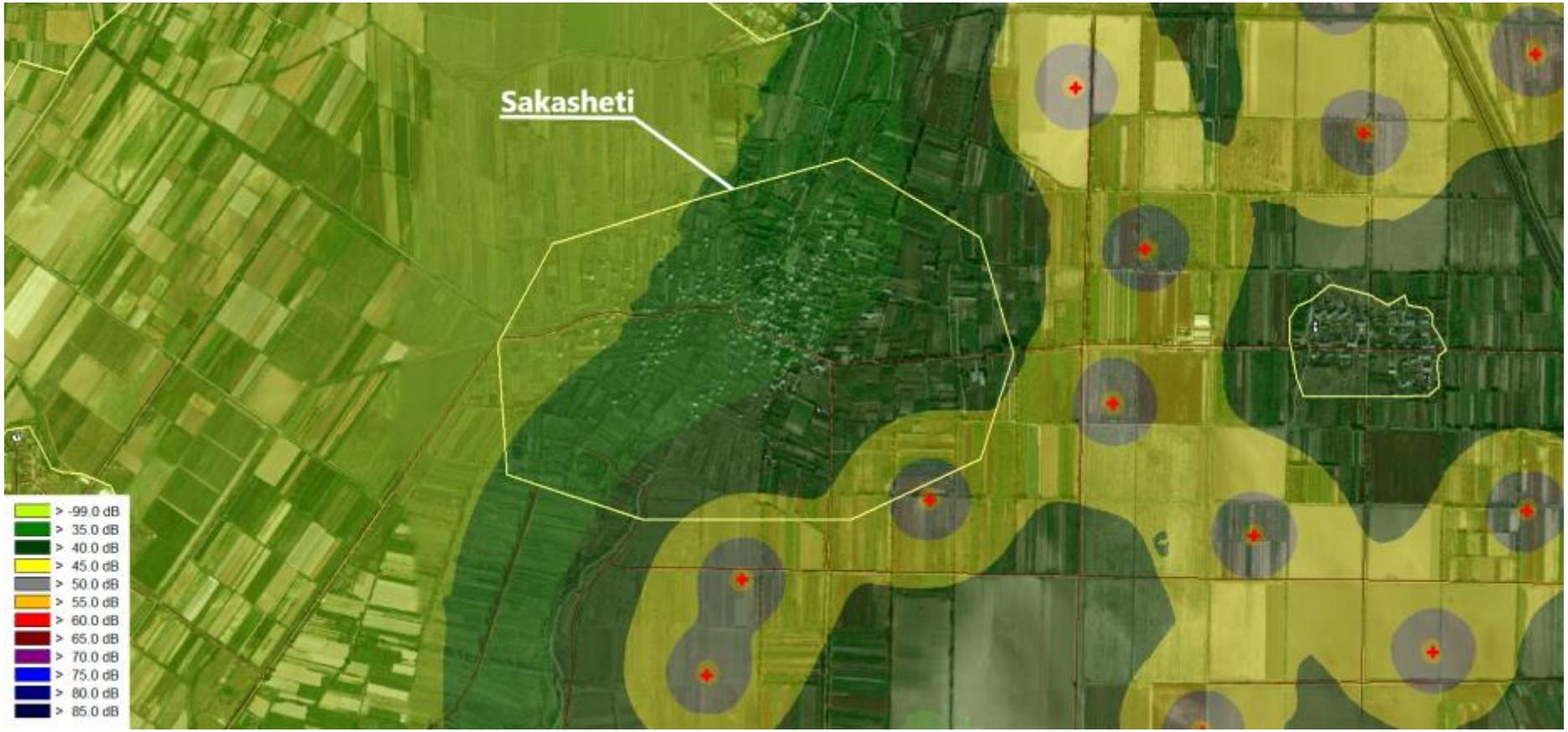


Figure N9.9: Propagation of noise in the vicinity of Sagolasheni village - Turbine Height - 105 m.

Figure N9.10: Propagation of noise in the vicinity of Dzvelijvari village - Turbine Height - 105 m.

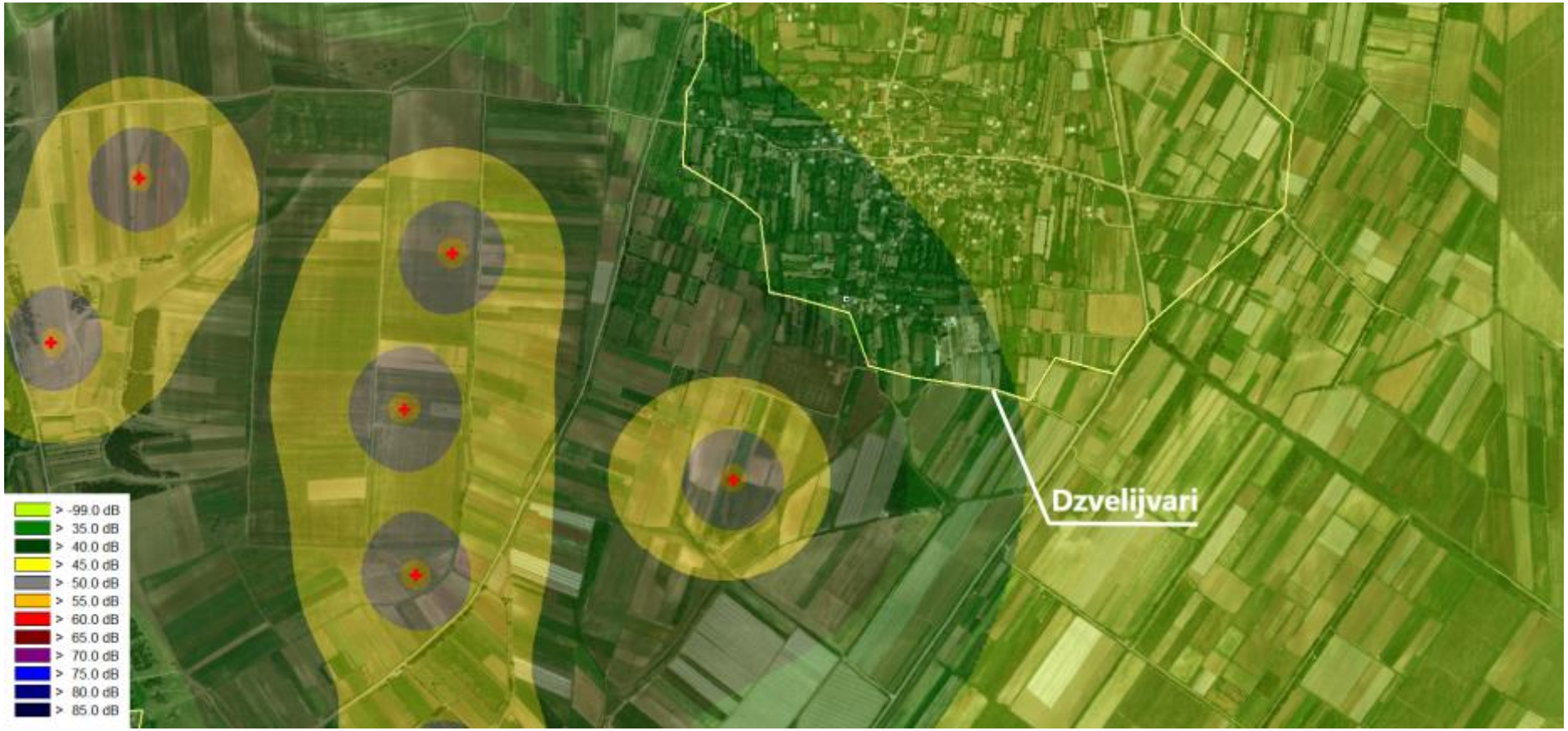


Figure N9.11: Propagation of noise in the vicinity of Bebnisi village - Turbine Height - 105 m.

Figure N9.12: Propagation of noise in the vicinity of Urbnisi village - Turbine Height - 105 m.

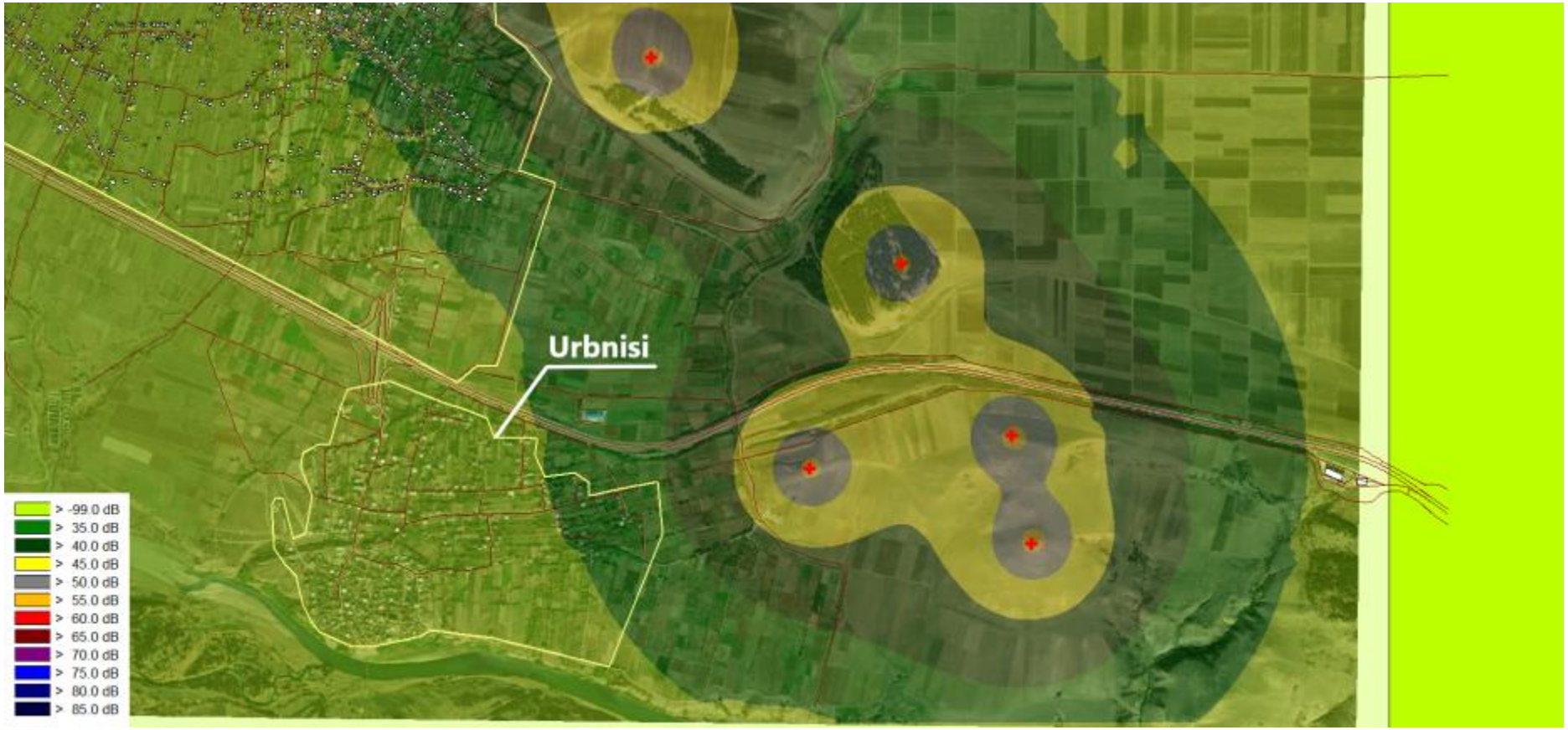


Figure N9.13: Propagation of noise in the vicinity of Kareli - Turbine Height - 105 m.

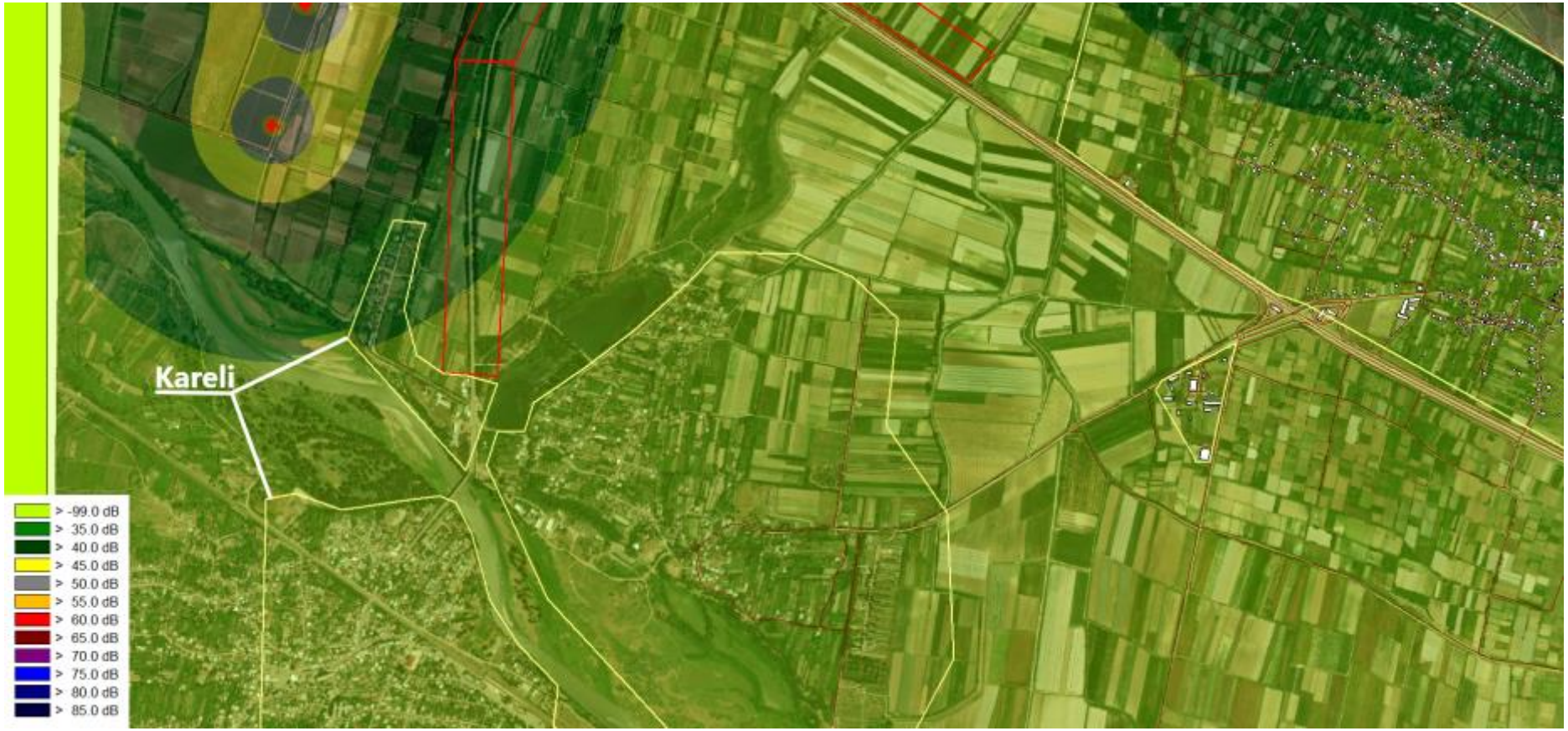


Figure N9.14: Propagation of noise in the vicinity of Commercial zone - Turbine Height - 105 m.

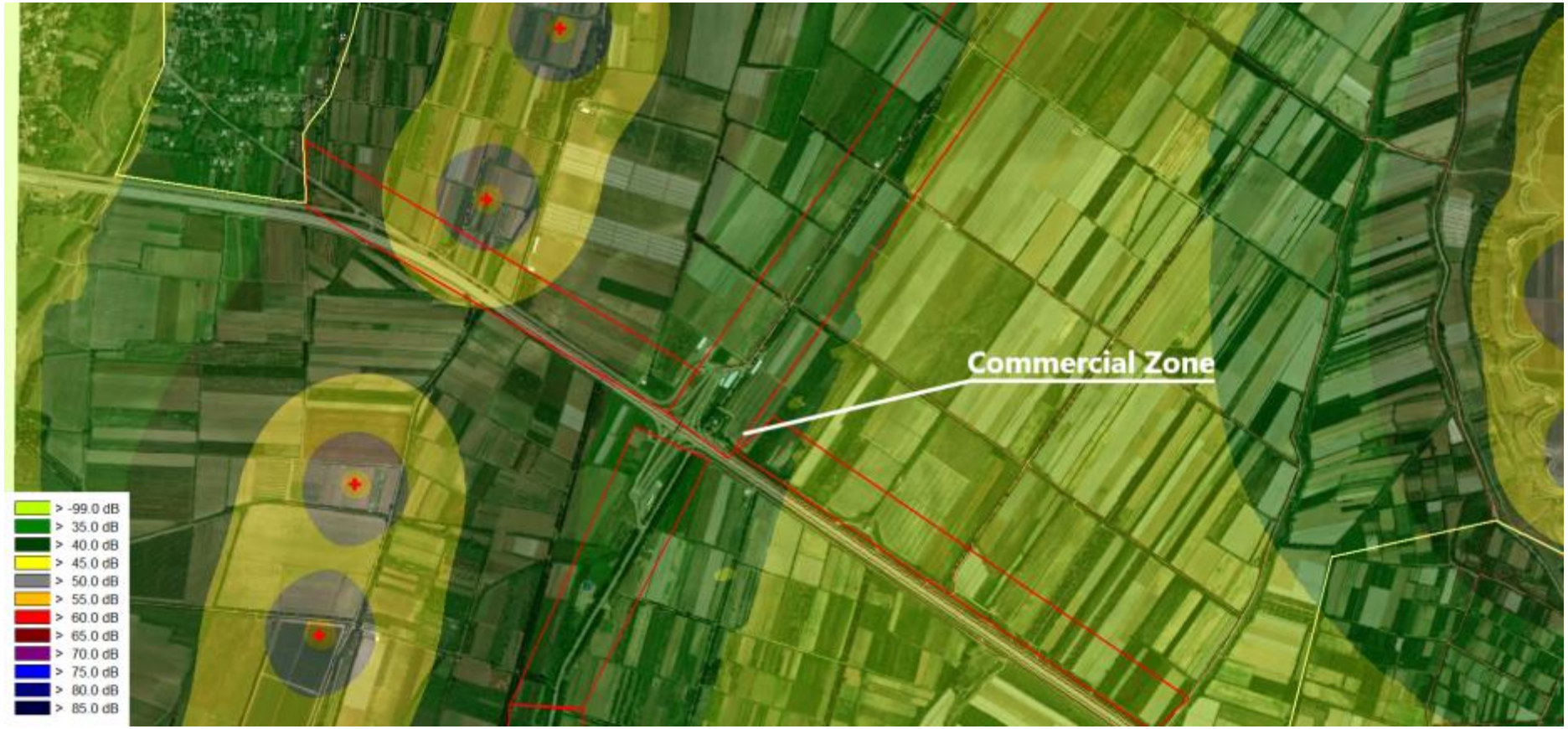


Figure N9.15: Propagation of noise in the vicinity of Arashenda village - Turbine Height - 150 m.

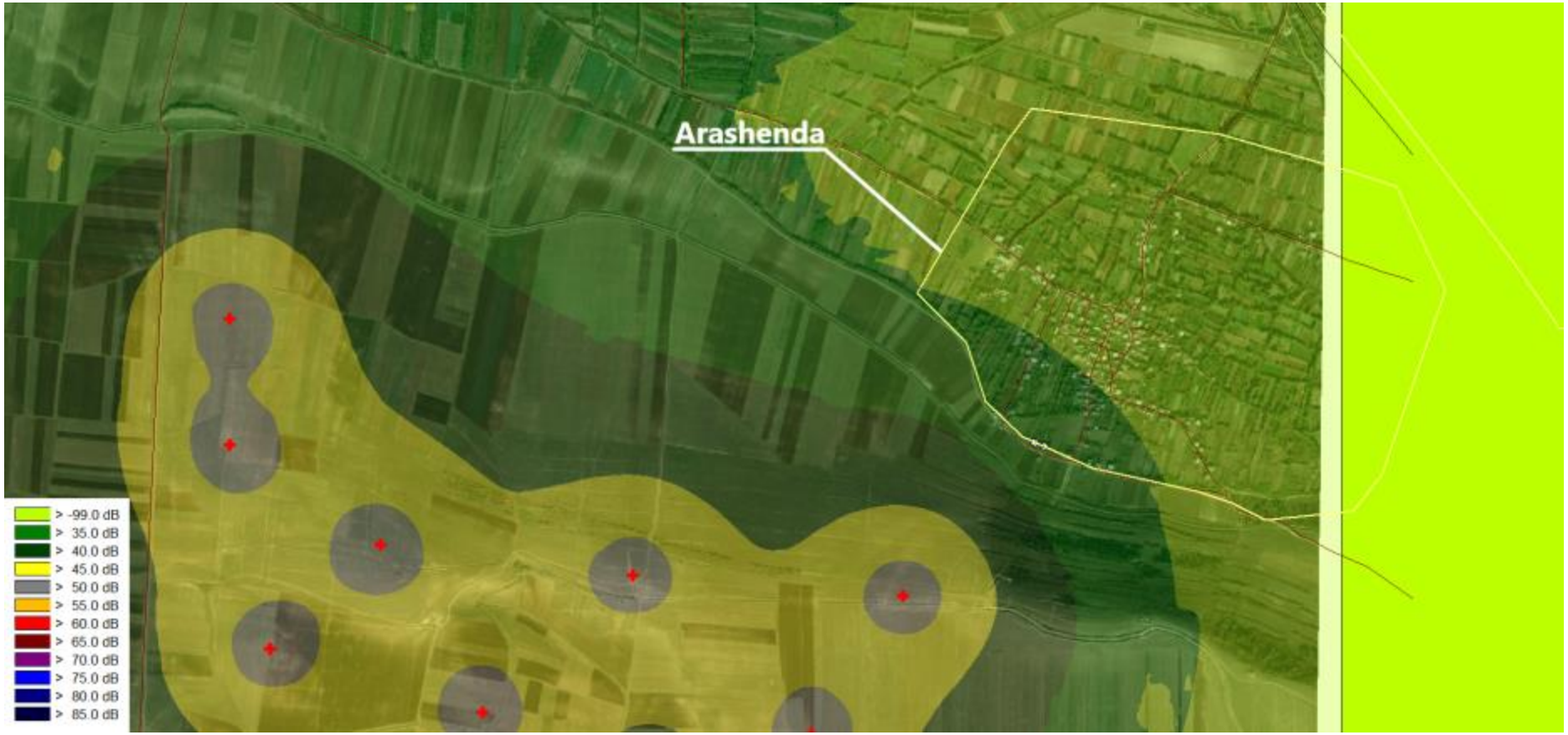


Figure N9.16: Propagation of noise in the vicinity of Breti village and Breti Meurneoba - Turbine Height - 150 m.

Figure N9.17: Propagation of noise in the vicinity of Variani village and Variani Meurneoba - Turbine Height - 150 m.

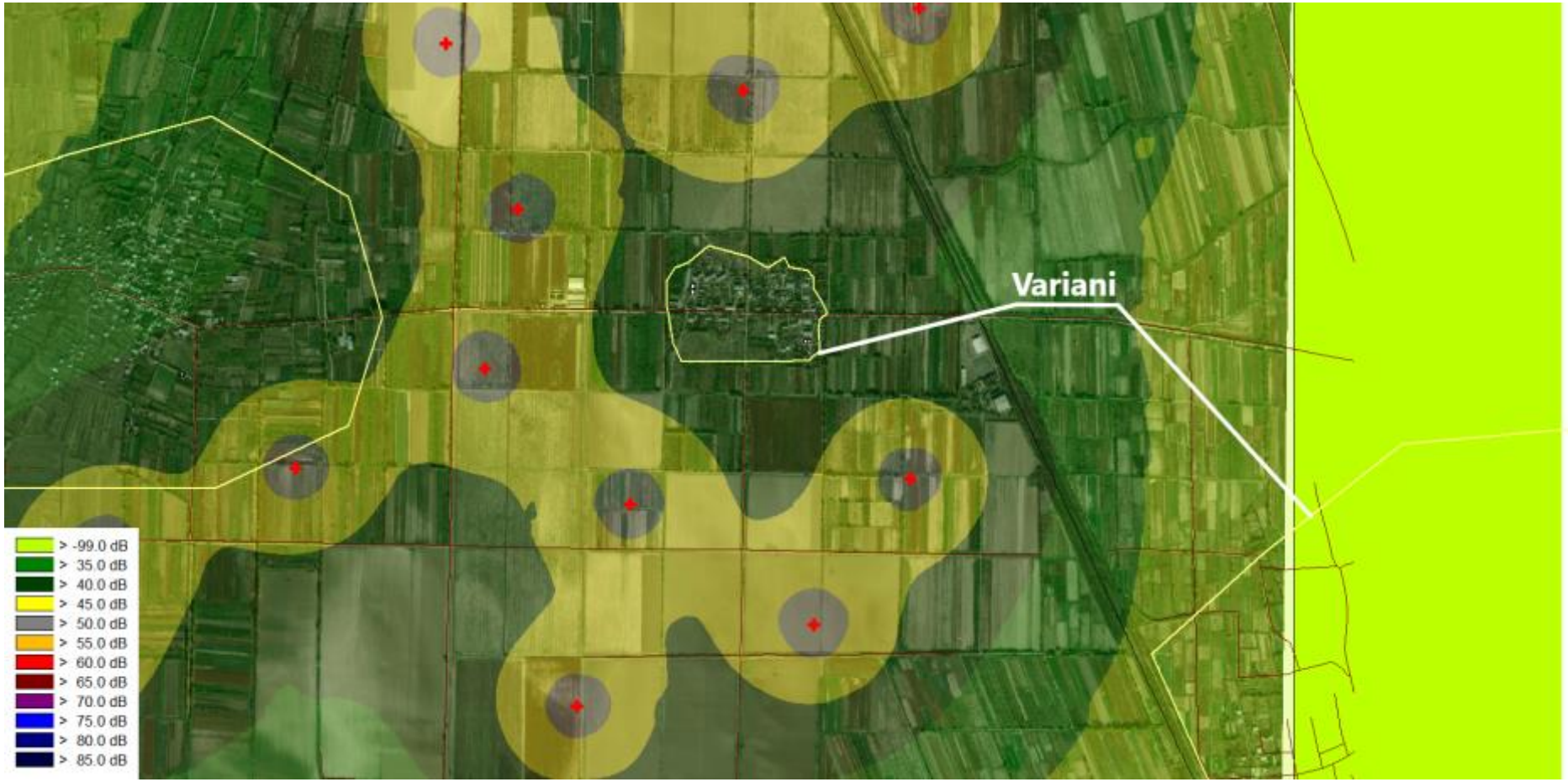


Figure N9.18: Propagation of noise in the vicinity of Ruisi village - Turbine Height - 150 m.

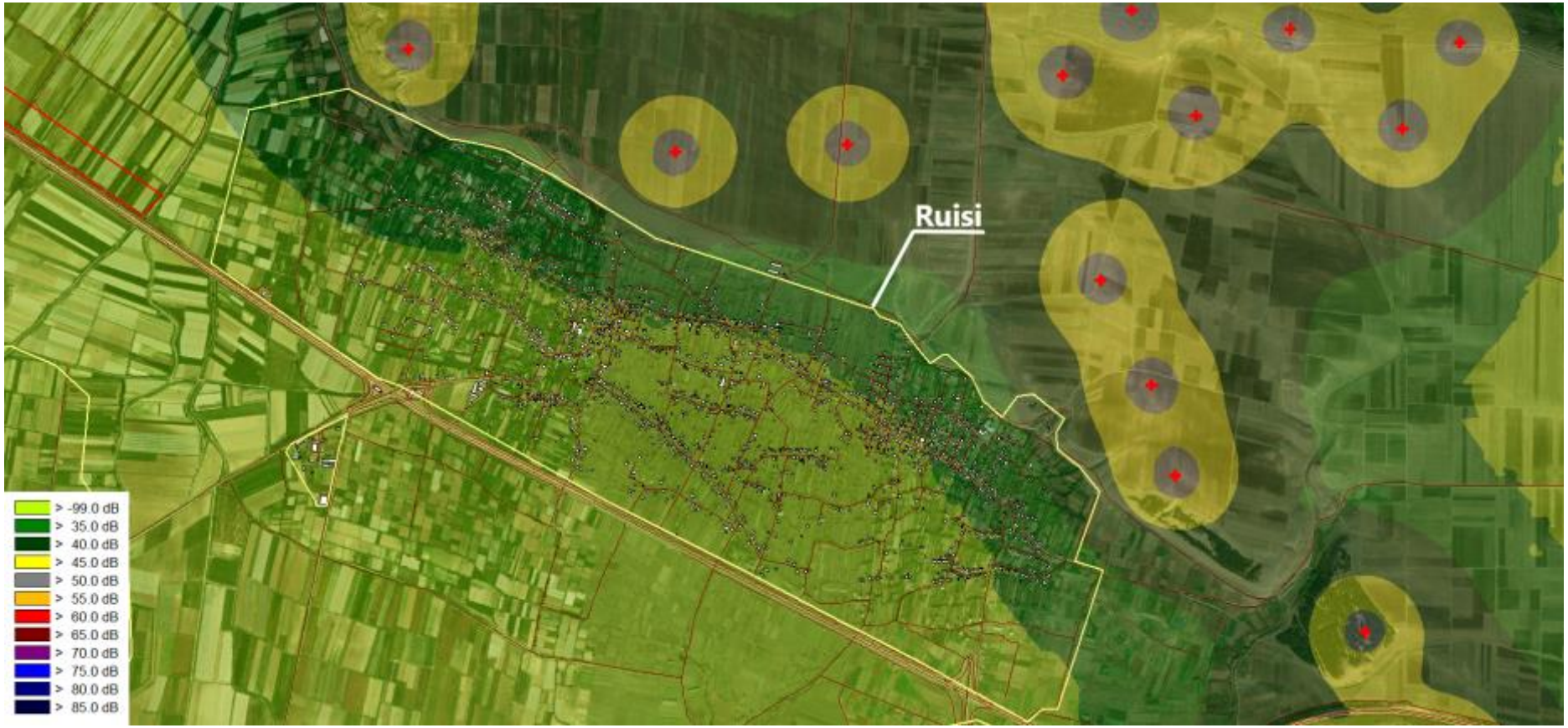


Figure N9.19: Propagation of noise in the vicinity of Sasireti village - Turbine Height - 150 m.

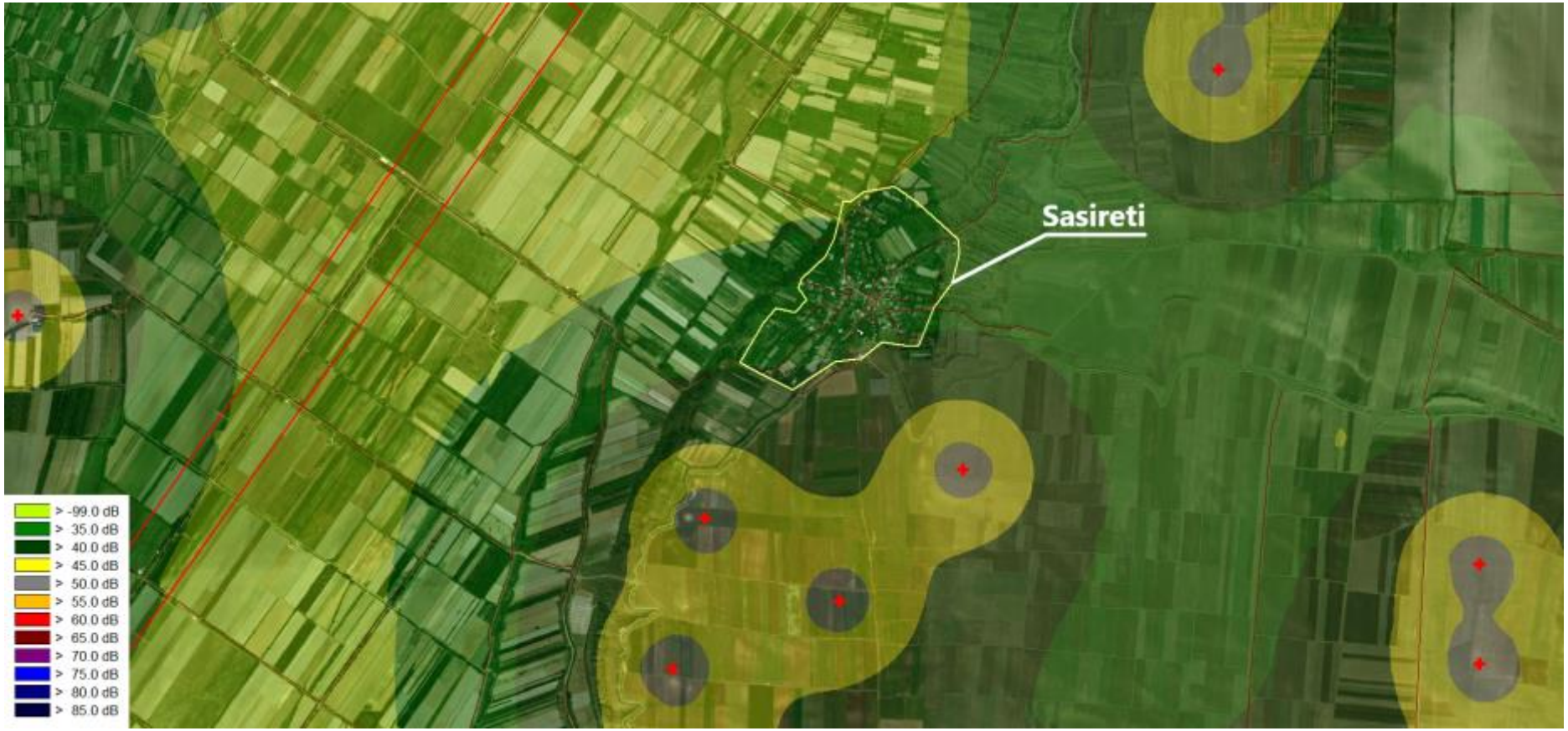


Figure N9.20: Propagation of noise in the vicinity of Sakasheti village - Turbine Height - 150 m.

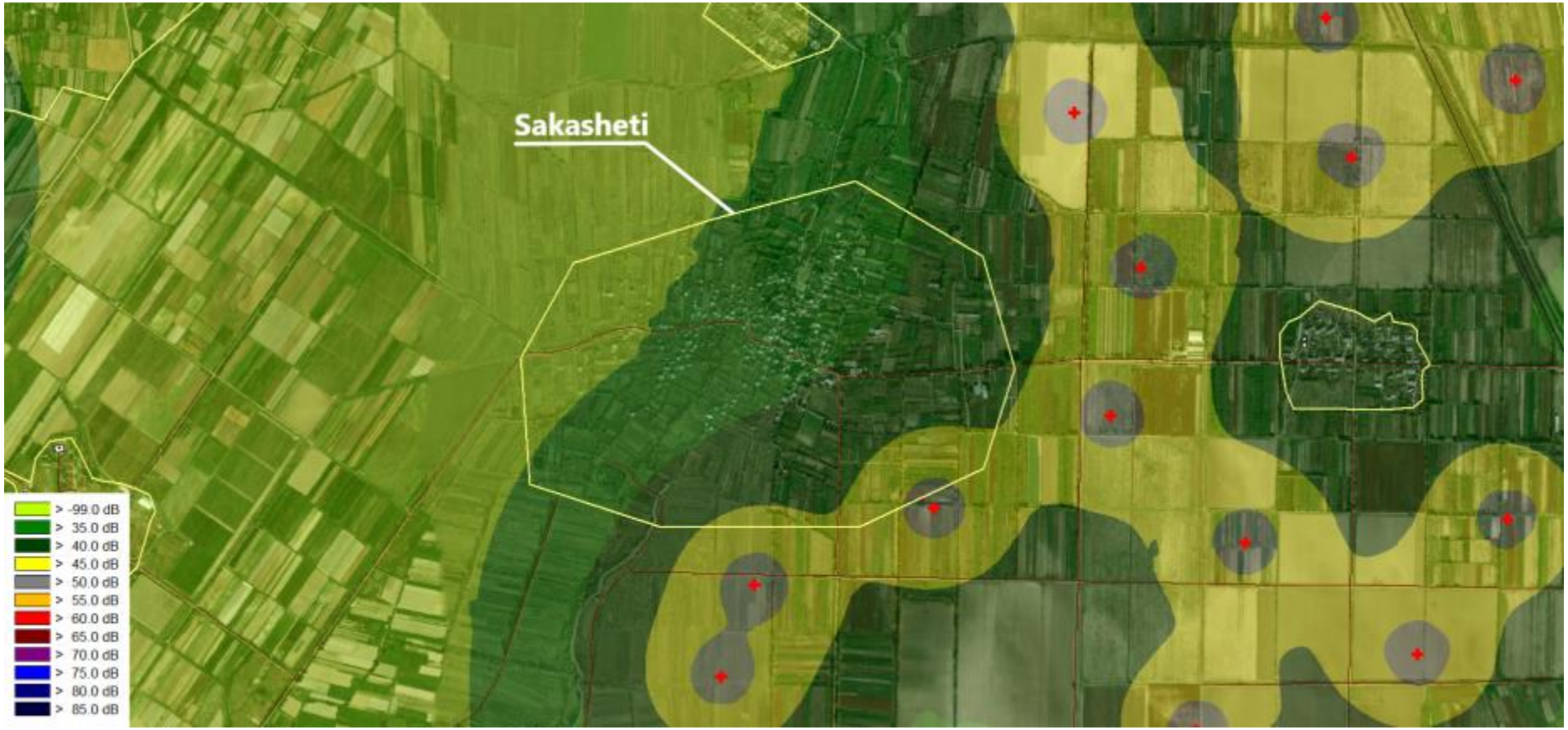


Figure N9.21: Propagation of noise in the vicinity of Sagolasheni village - Turbine Height - 150 m.

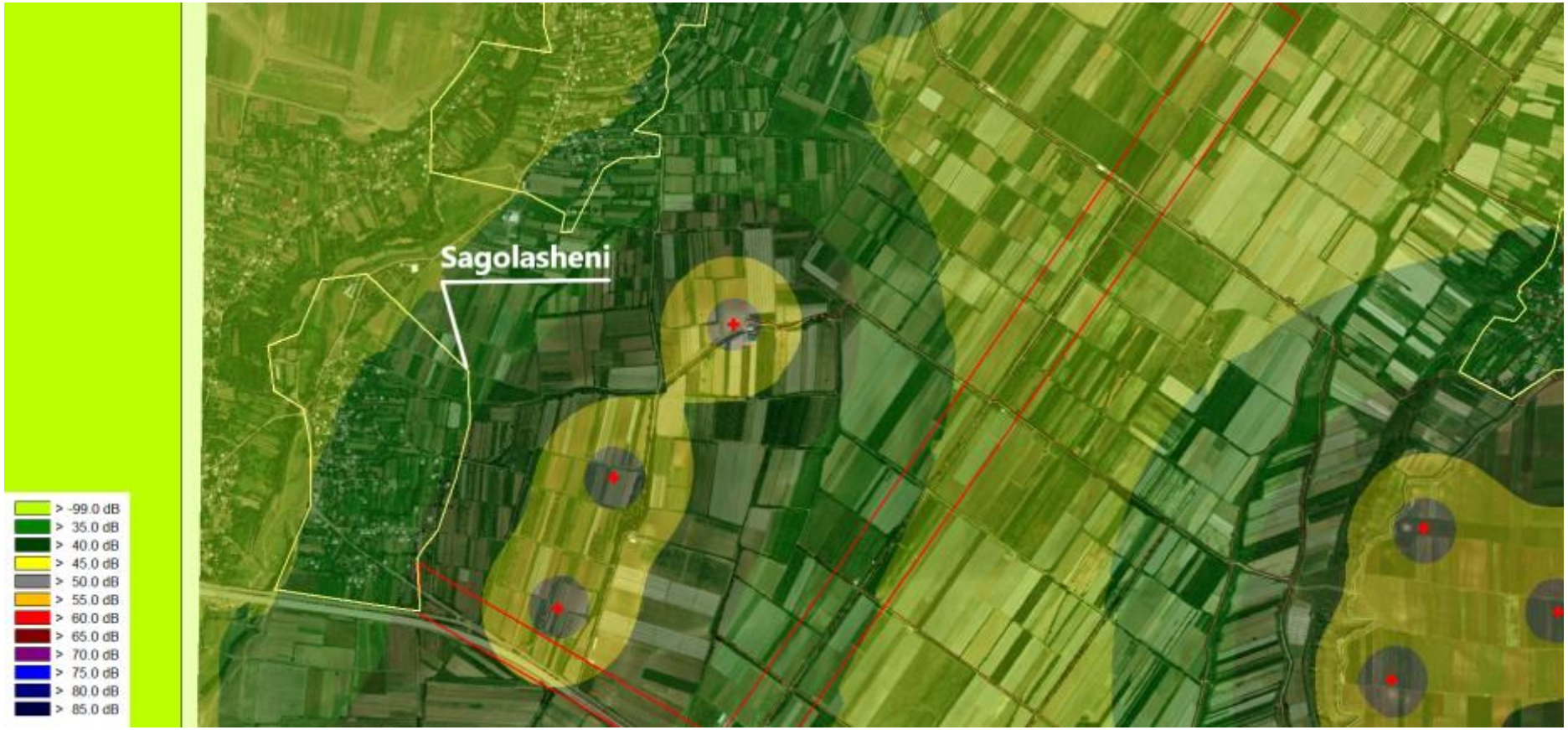


Figure N9.22: Propagation of noise in the vicinity of Dzvelijvari village - Turbine Height - 150 m.

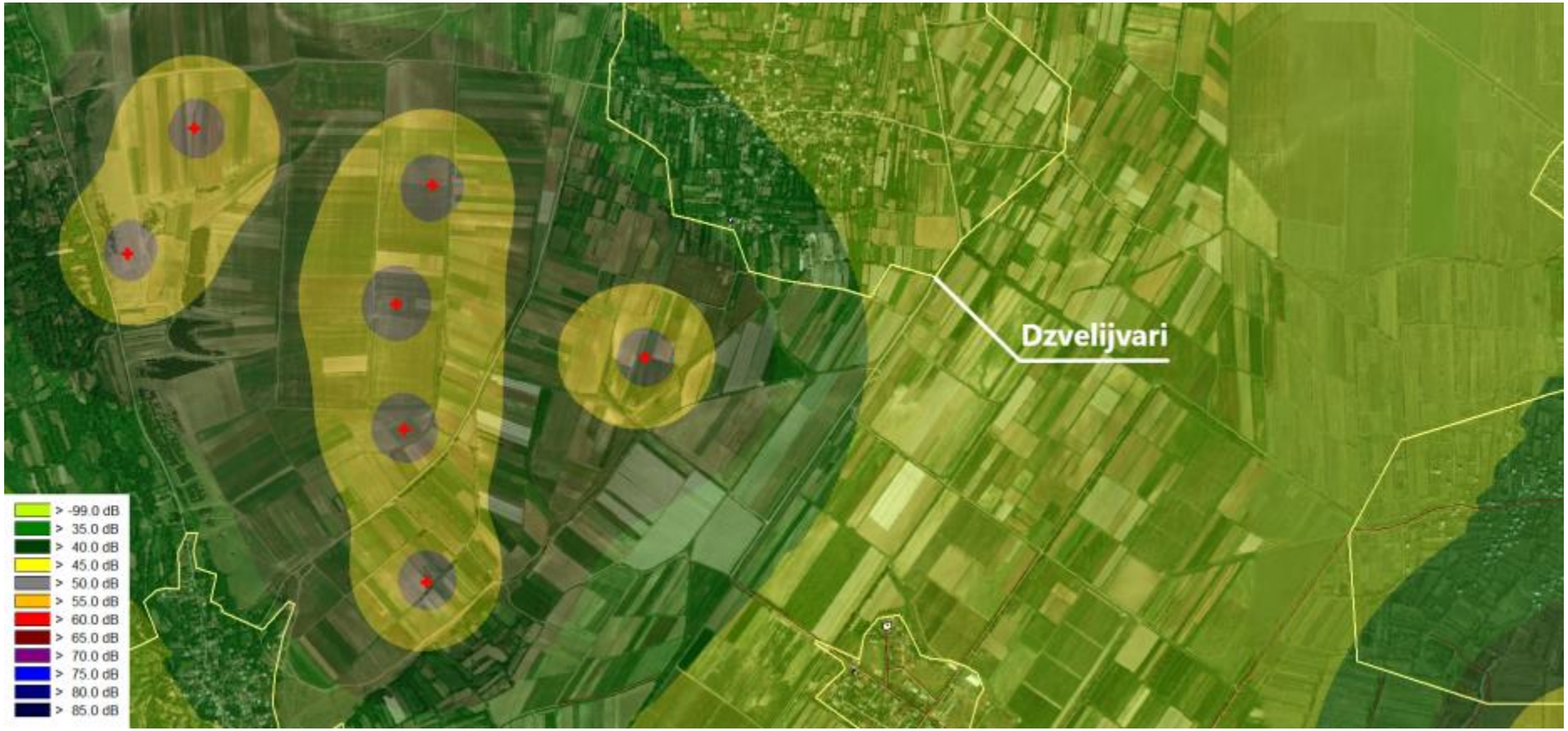


Figure N9.23: Propagation of noise in the vicinity of Bebnisi village - Turbine Height - 150 m.

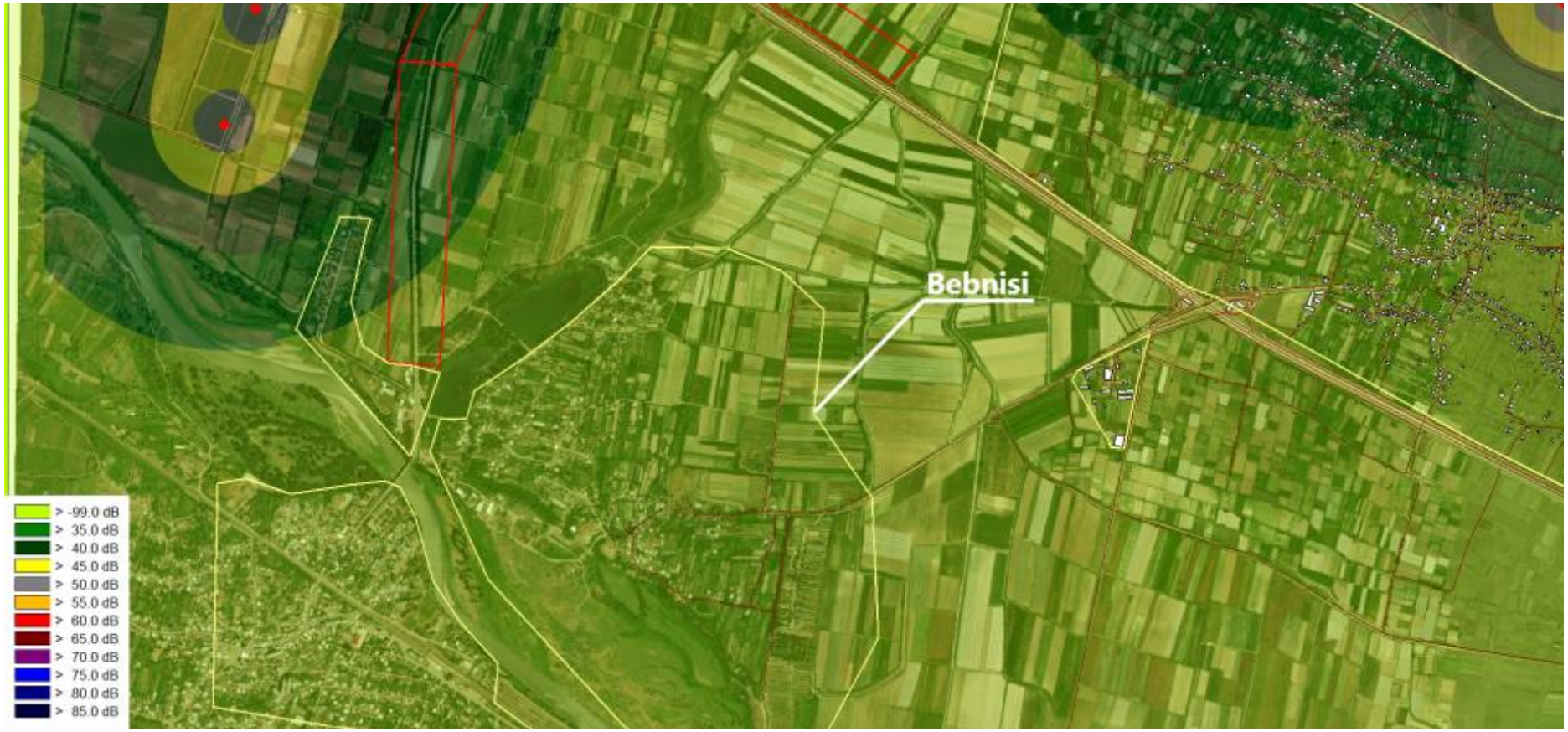


Figure N9.24: Propagation of noise in the vicinity of Urbnisi village - Turbine Height - 150 m.

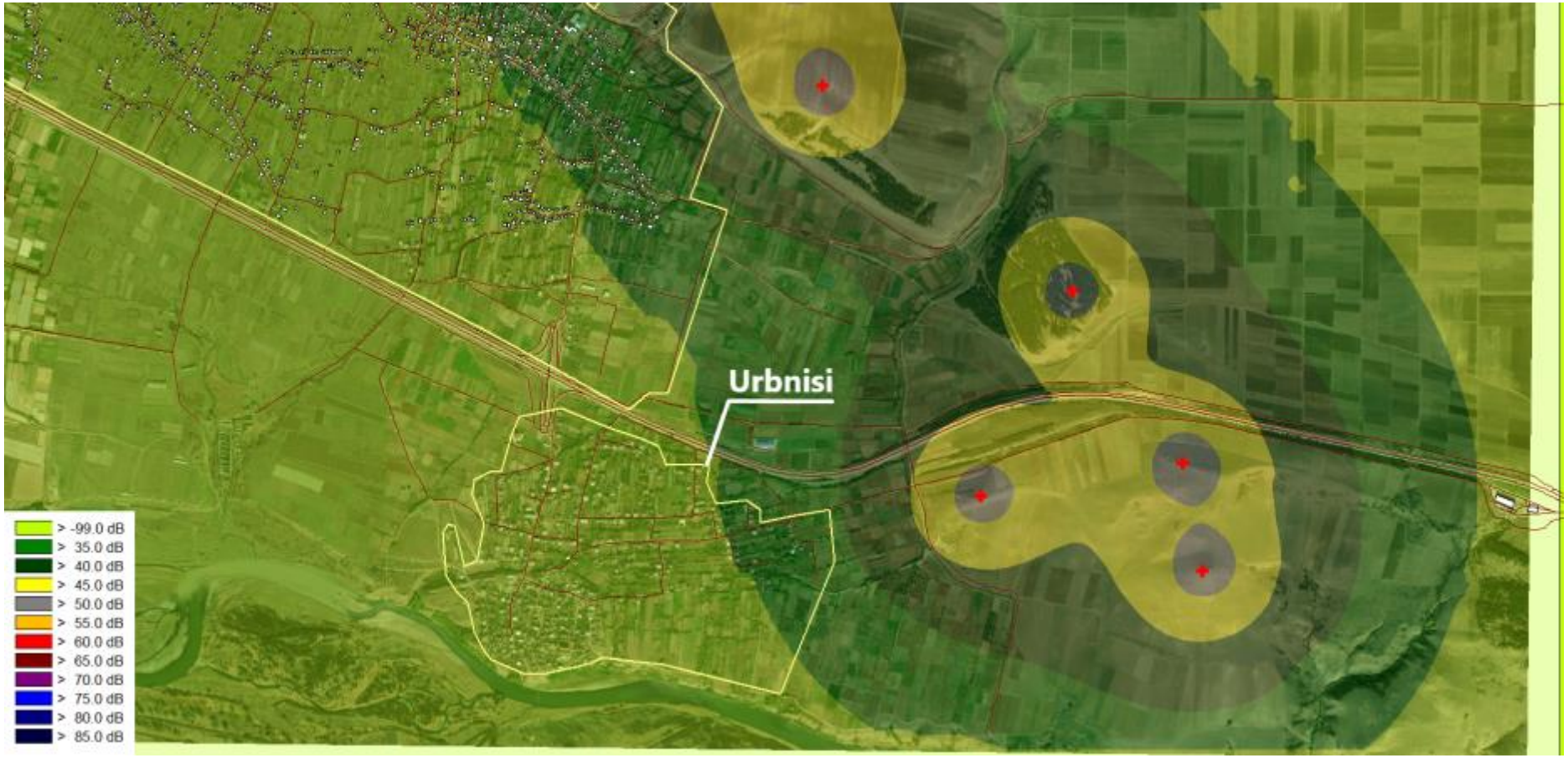
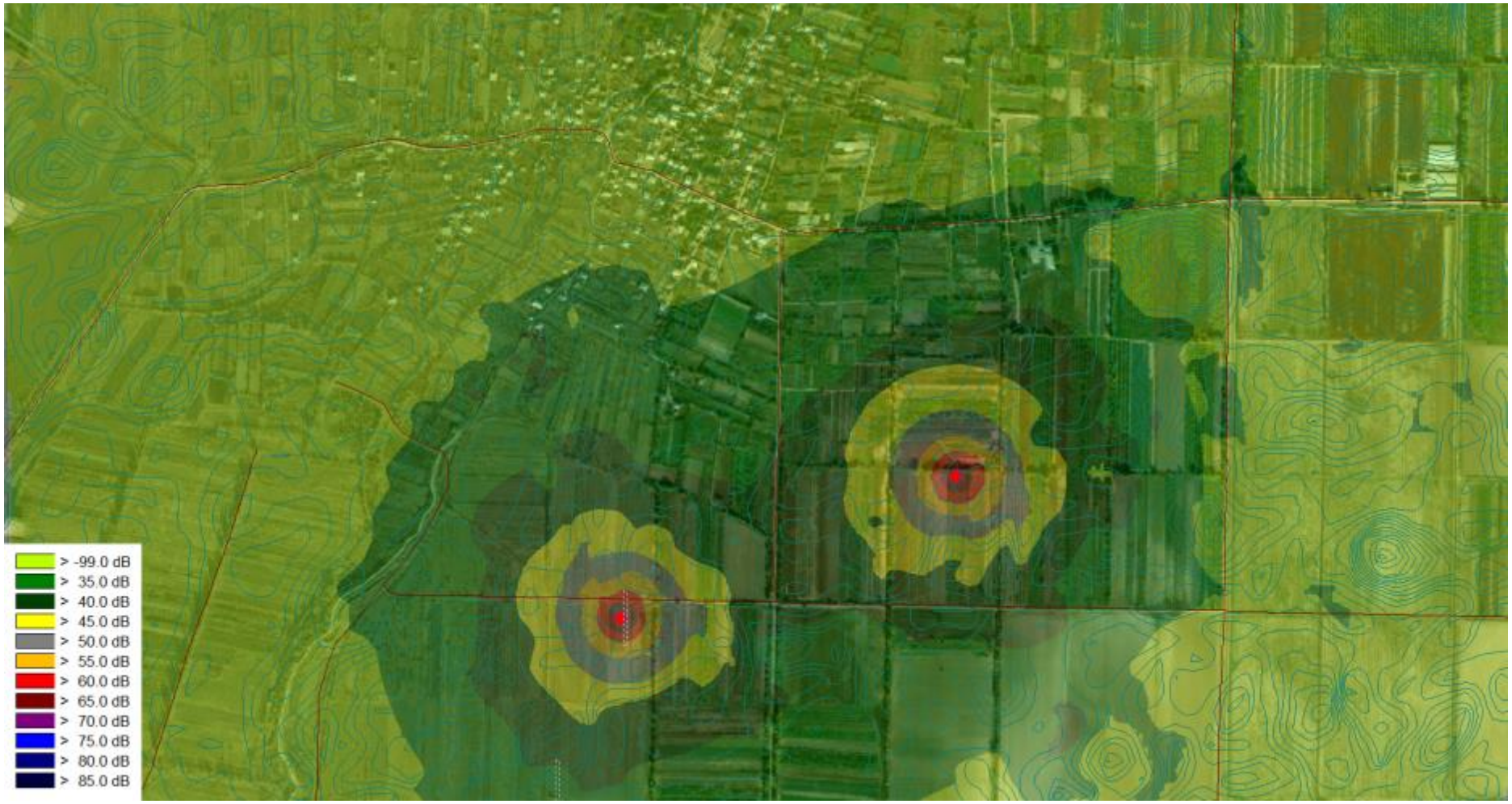


Figure N9.25: Propagation of noise in the vicinity of Kareli - Turbine Height - 150 m.

Figure N9.26: Propagation of noise in the vicinity of Commercial zone - Turbine Height - 150 m.

Figure N9.27: Noise propagation for the construction stage, in the vicinity of Sakasheti village (the closest location of construction sites to the settlements and residential houses)



10. Conclusion

- The noise study (modeling) was done within the scope of Ruisi wind power plant construction project;
- Noise modeling was carried out with worldwide accepted German CadnaA software;
- Works to obtain the input information were provided within the scope of noise modeling, used for modeling.
- The baseline measurements were performed on the area of the residential buildings adjacent to the project wind farm. The measurement was performed from 2022/09/17 to 2022/09/18. The noise measurement was performed continuously for 24 hours. Baseline noise measurements were performed at 5 locations adjacent to the project wind farm;
- As the obtained results evidence, in the wind turbines operation phase, the level of noise caused by the wind turbine operation will not exceed 40 dBA at the nearest building found in village Arashenda (in both scenario (105 m. and 150 m.)). This noise level is lower than the day and night noise standards established by the legislation of Georgia;
- In the wind turbines operation phase, the level of noise caused by the wind turbine operation will not exceed 40 dBA at the nearest building found in village Breti (in both scenario (105 m. and 150 m.)). This noise level is lower than the day and night noise standards established by the legislation of Georgia;
- In the wind turbines operation phase, the level of noise caused by the wind turbine operation will not exceed 42 dBA at the nearest building found in village Variani (in both scenario (105 m. and 150 m.)). This noise level is lower than the day and night noise standards established by the legislation of Georgia;
- In the wind turbines operation phase, the level of noise caused by the wind turbine operation will not exceed 42 dBA at the nearest building found in village Ruisi (in both scenario (105 m. and 150 m.)). This noise level is lower than the day and night noise standards established by the legislation of Georgia;
- In the wind turbines operation phase, the level of noise caused by the wind turbine operation will not exceed 40 dBA at the nearest building found in village Sasireti (in both scenario (105 m. and 150 m.)). This noise level is lower than the day and night noise standards established by the legislation of Georgia;
- In the wind turbines operation phase, the level of noise caused by the wind turbine operation will not exceed 41 dBA at the nearest building found in village Sagholasheni (in both scenario (105 m. and 150 m.)). This noise level is lower than the day and night noise standards established by the legislation of Georgia;
- In the wind turbines operation phase, the level of noise caused by the wind turbine operation will not exceed 40 dBA at the nearest building found in village Dzvelijvari (in both scenario (105 m. and 150 m.)). This noise level is lower than the day and night noise standards established by the legislation of Georgia;
- In the wind turbines operation phase, the level of noise caused by the wind turbine operation will not exceed 43 dBA at the nearest building found in village Sakasheti (in both scenario (105 m. and 150 m.). This noise level is lower than the day and night noise standards established by the legislation of Georgia;
- Noise modeling results for the wind turbines construction phase are given for the nearest residential houses in village Sakasheti, which are located closest the two turbines. The noise level at the nearest building in case of simultaneous installation of two turbines will not exceed 40 dBA. This noise level is lower than the day and night noise standards established by the legislation of Georgia;
- Overall, as the modeling results have evidenced, the noise level generated in the construction and operation phases of the wind turbines at the nearest residential buildings does not exceed the day and night noise standards established by the legislation of Georgia;

- It should be considered that all calculations above were made for the case of simultaneous operation of all noise sources;
- Noise modeling is also performed in the commercial zone adjacent to the project area. As the modeling results showed, as a result of the operation of the WPP (under both scenarios), the noise levels within the commercial zone do not exceed 55 dBA. In the section of the commercial zone, which is closest to the area where the stations are located, the noise level is 52 dBA. In all other cases, noise levels are much lower (ranging from about 40-45 dBA);
- Since the permissible norm of noise for commercial / industrial purpose buildings is 60 dBA according to the national legislation, exceeding the permissible norm of noise in the mentioned area is not fixed as a result of modeling.

11. Recommendations

The basis of all measures on noise reduction at the plants is the hygienic standardization of noise parameters considering both, the type of labor (degree and intensity of labor) and spectral structure of noise.

The noise control measures applied at the plants are subdivided into technical, architectural-design, organizational and therapeutic-preventive ones.

To ensure the health and safety of the service personnel, it is advisable to take the following measures:

- Technical measures are applied in 3 main directions: eliminating the cause of noise or reducing its intensity directly where it originates; Reducing noise transmission (shielding); Direct protection of workers from noise;
- The most efficient technical means to reduce noise is the replacement of noisy technological operations at the plants with less noisy ones, e.g. using welding or hydraulic connection instead of riveting to connect metal parts;
- The noise level can be reduced by improving the design of machines and equipment and rationalizing their operation mode, as well as installing additional noise mufflers (attenuators) on the equipment, etc;
- Personal protective equipment, such as headphones, should be used by the service personnel with noisy professions:
- The means of medical prevention, such as establishment of dispensary supervision and periodic medical examinations, play an important role within the system of preventive measures;
- It is desirable to reduce the cycle of the working teams so that the workers in one shift working in a certain area are not exposed to high noise level for a long time;
- The technical state of the operated equipment must be always satisfactory;
- Regular preventive inspection of the machines and equipment is necessary;
- Periods of simultaneous operation of machines and plants should be reduced;
- Idling of machines and equipment should be avoided;
- The technical state of the used machines should be monitored constantly.

A human body may adapt to the action of noise can be developed. Decrease in noise perception by 10-15 dBA and restoration of the initial level of sound perception within 2 or 3 minutes is the sign of adaptation to noise. More intense changes are the sign of auditory fatigue needing urgent medical examination as soon as reported.

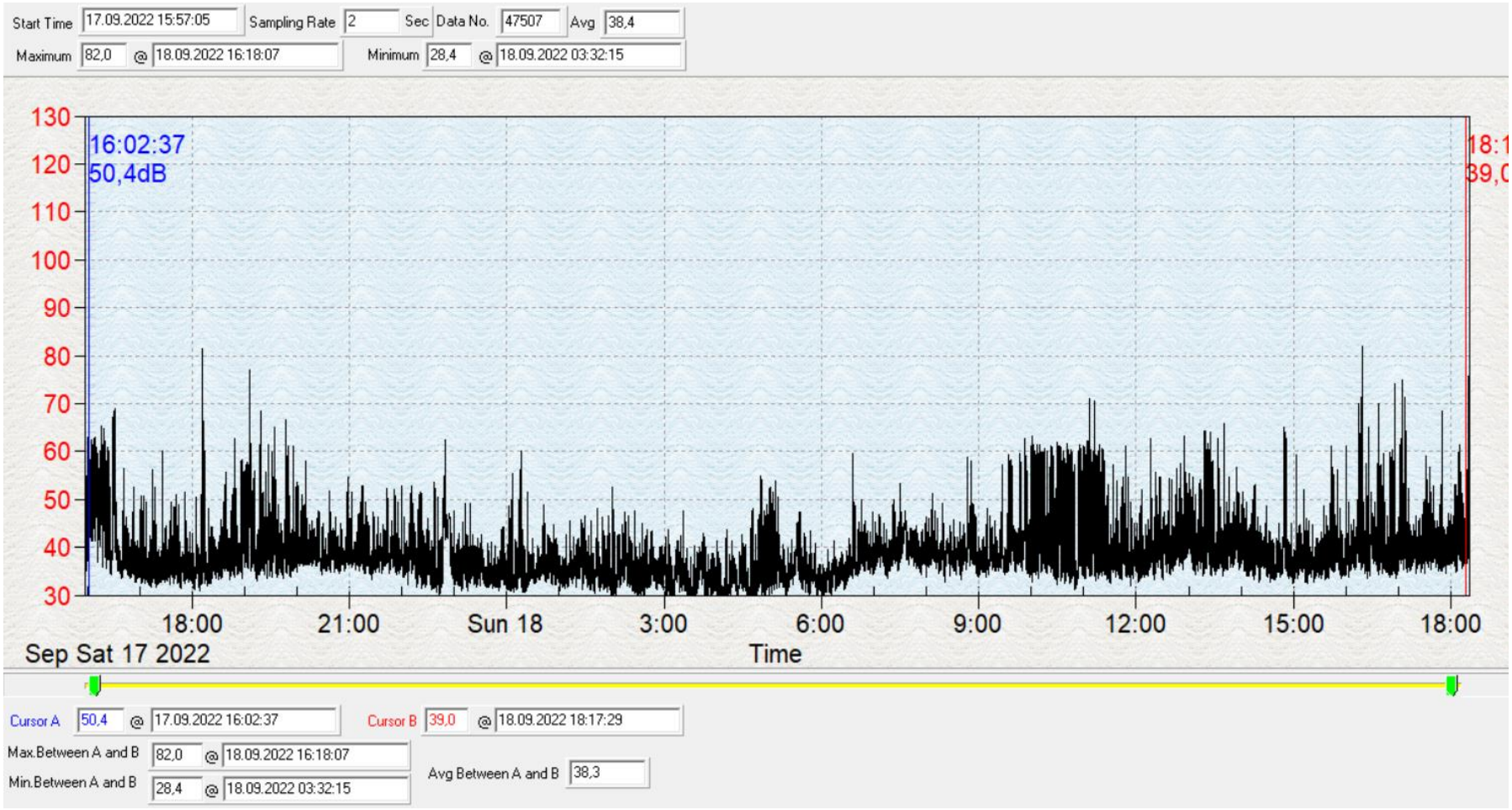
Annex N1: Noise Measurement Photos

Measurement Location N1	Measurement Location N1
	
Measurement Location N2	**Measurement Location N2**
	
Measurement Location N3	**Measurement Location N3**
	
Measurement Location N4	**Measurement Location N4**
	
Measurement Location N5	**Measurement Location N5**

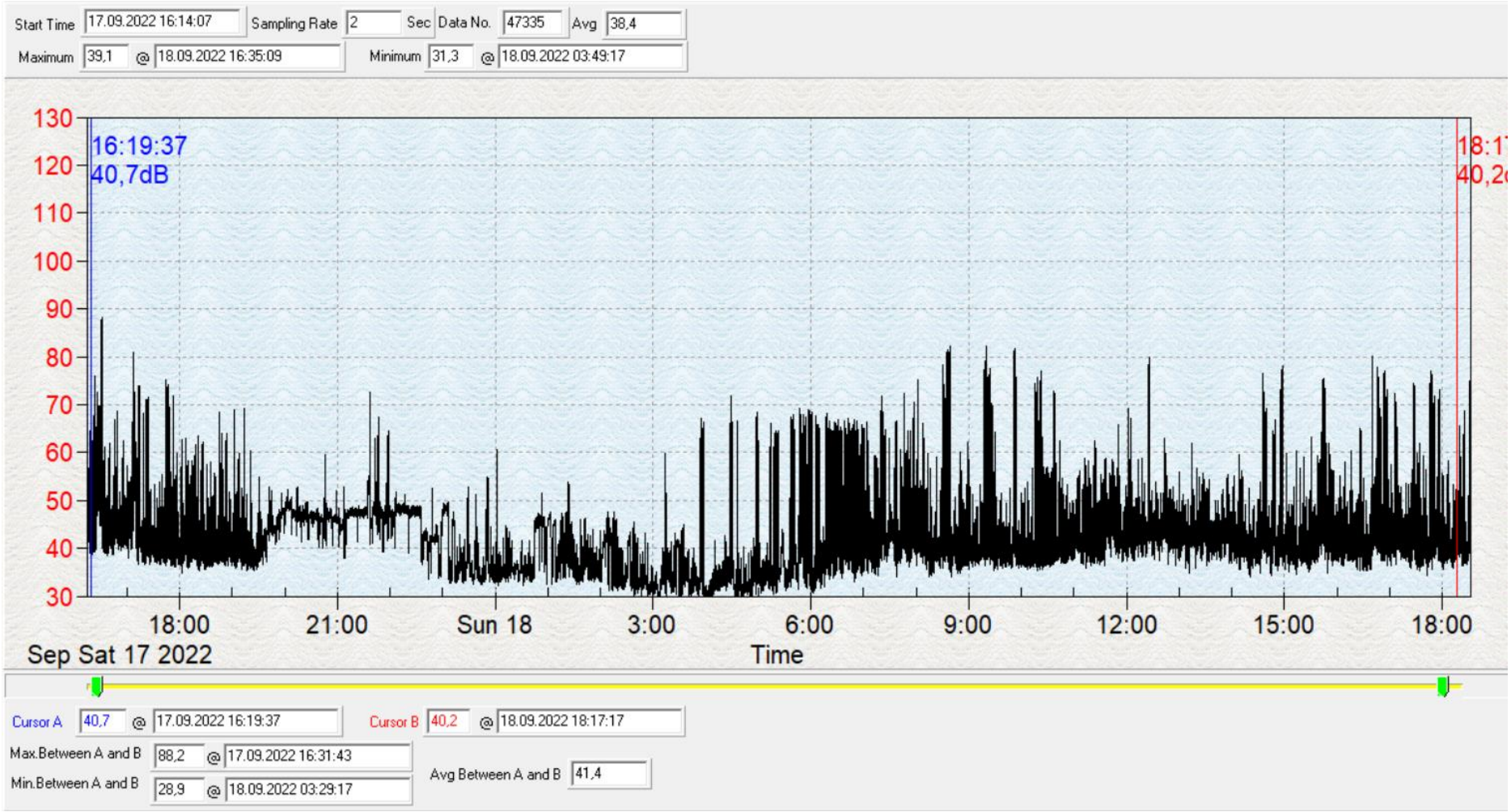
	

Annex N2: Graphical Results of Noise Measurements

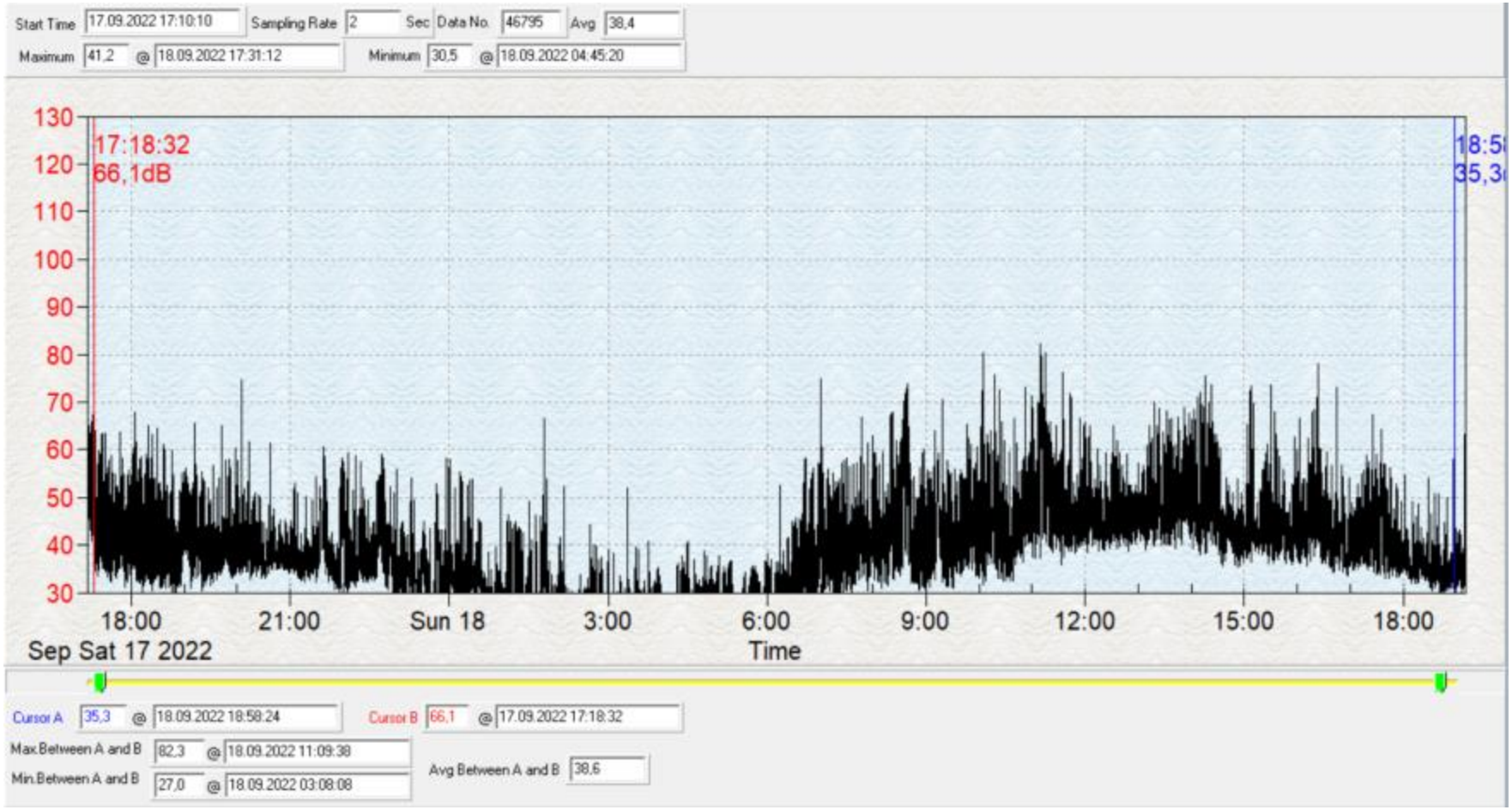
N1 Location - Vill. Ruisi



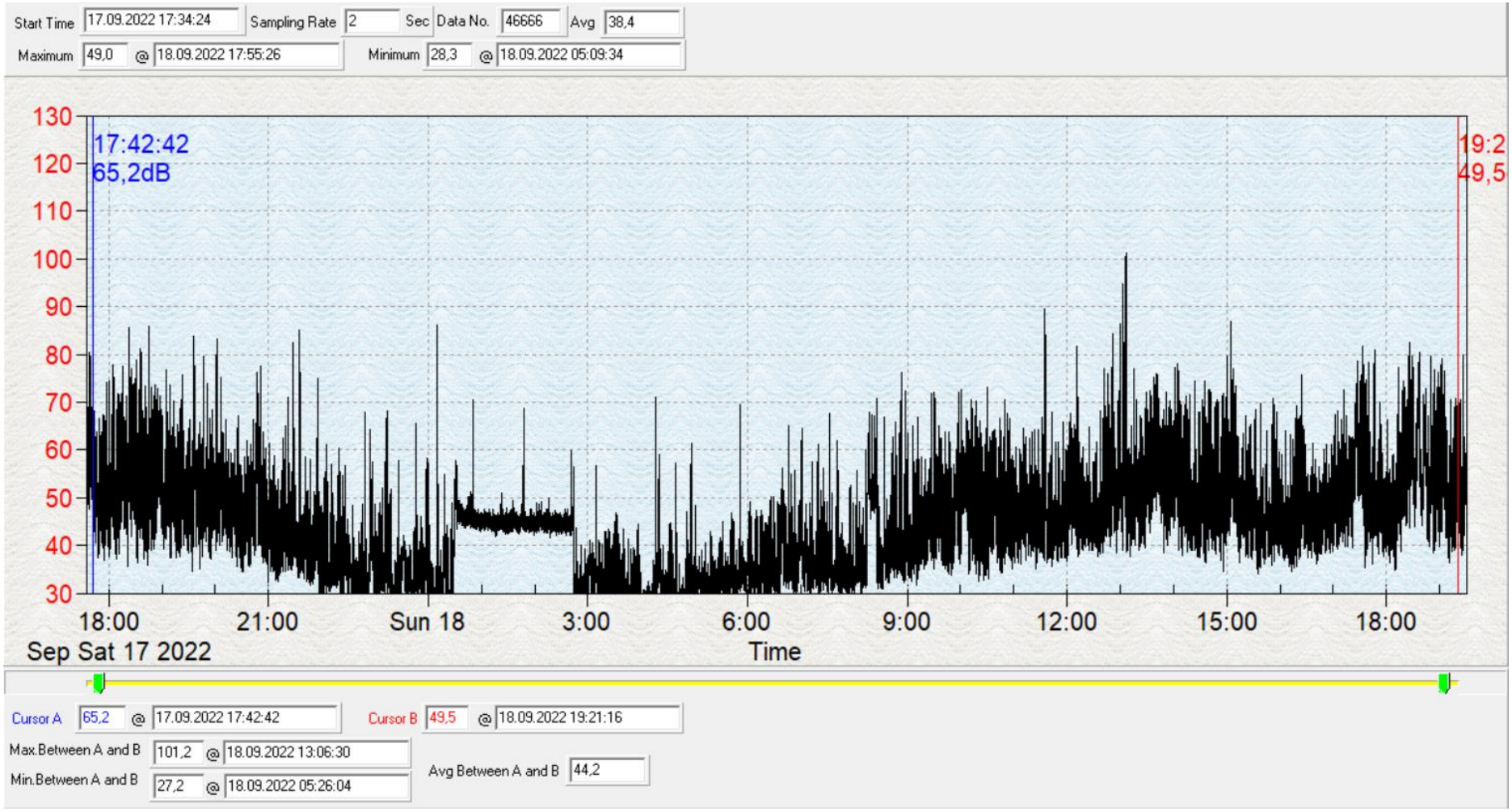
N2 Location - Vill. Ruisi



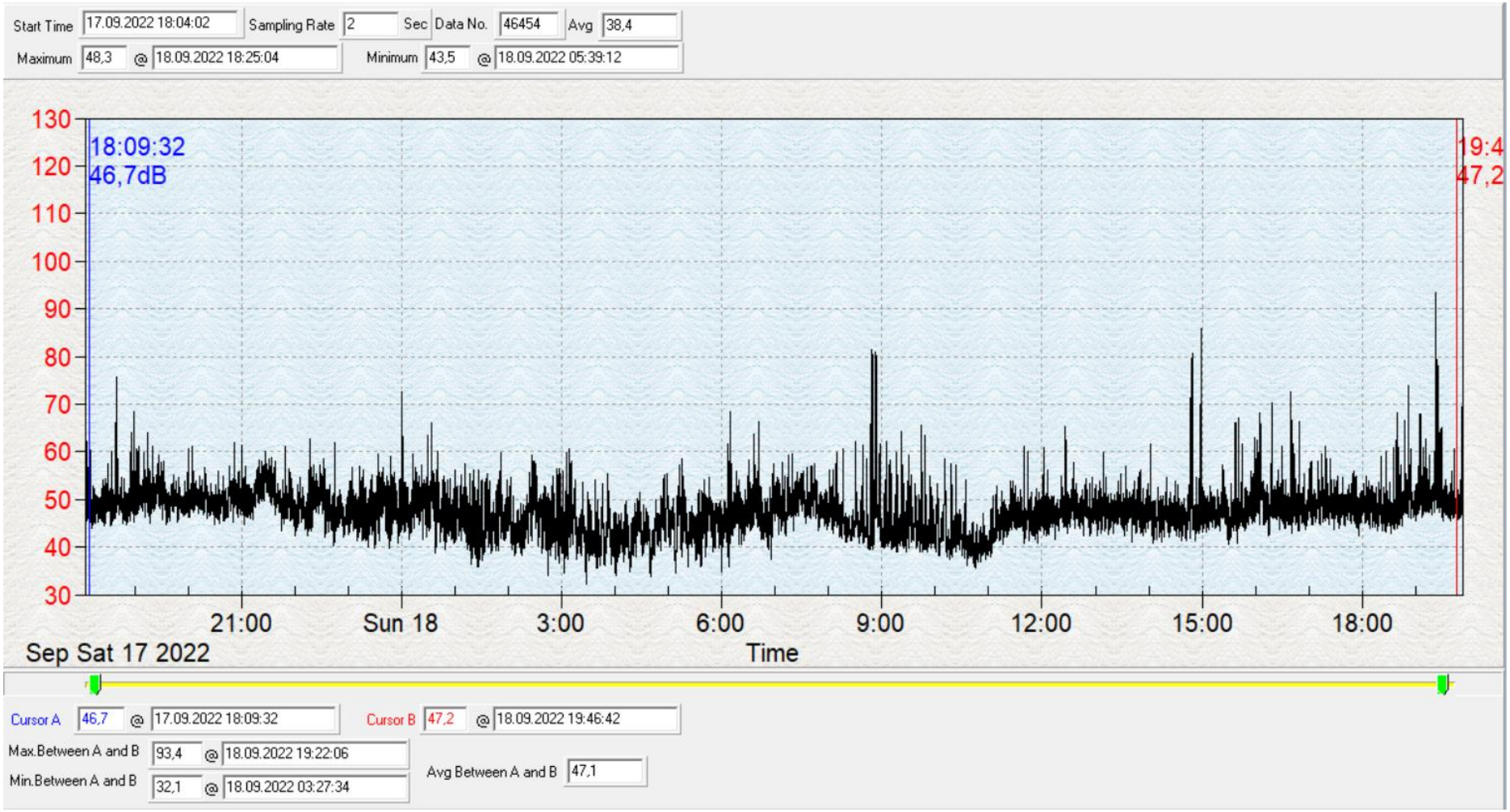
N3 Location - Vill. Sasireti



N4 Location - Vill. Sakasheti



N5 Location - Vill. Sagolasheni



Annex N3: Noise Modeling Software Certificates

DataKustik
Software for Immission Protection

Certificate of Attendance

CadnaA®

Individual Seminar

Archil Revazishvili

05.06.18 - 07.06.18 in Tbilisi, Georgia

Contents:

- Basic Handling of CadnaA
- Basics of Sound Calculation
- Advanced Import of Third Party File Formats
- Special Road Modelling Cases
- Organization of Road Projects
- Export and Reporting
- Air Pollution Calculations within Road Projects
- Application to a Real Road Project

Trainer:
Antonio Notario

Fabian Probst
Managing Director

DataKustik
Software for Immission Protection

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Trainer:
Antonio Notario

Fabian Probst
Managing Director

Annex 8. Shadow Flickering Modelling

FRACTAL d.o.o. Split

WF Gori

Calculation of shadow flicker

Split, September 2022

FRACTAL d.o.o. POWER SYSTEM ENGINEERING AND CONSULTING

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Client:

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Croatia

Authors: Eugen Mudnić, Ph.D.

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Ante Tojčić, MScEE.

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1 INTRODUCTION

Fractal d.o.o. has been commissioned by Client to independently assess the expected shadow flicker impact in the vicinity of the proposed Gori wind farm. Two layouts with different number of WTGs, and additionally microsited turbines are assessed:

- Layout *rejected*: 50 WTGs
- Layout *new*: 46 WTGs

The results are presented in the following chapters.

2 WIND TURBINES POSITIONS

Coordinates of two layouts (rejected ,new) as a source of shadow flicker emission and most exposed surrounding receptors are given in the following tables. Wind turbine positions at topographic map are shown at the following figures.

Table 1 Layout *rejected* : Wind turbine positions coordinates (UTM WGS84 Zone38

WTG	Easting	Northing	WTG	Easting	Northing
01	418012	4652230	26	408968	4656812
02	416334	4656201	27	416728	4658801
03	415967	4655857	28	416218	4661384
04	418092	4651798	29	418031	4659687
05	416566	4653746	30	417376	4661200
06	417568	4652920	32	409203	4657357
07	416168	4654777	33	417655	4659120
08	416673	4655645	34	414740	4659029
09	417201	4652097	35	414831	4655492
10	408435	4655424	36	409701	4657994
11	410041	4660165	37	416498	4660737
12	418071	4656033	38	412583	4657145
13	417945	4662101	41	410957	4661103
14	412506	4655997	42	409067	4662061
15	408548	4655905	44	413149	4656799
16	415834	4656953	46	415632	4659731
17	413919	4655453	48	416934	4659587
18	416438	4654221	49	410065	4661823
19	412449	4656513	52	416218	4661384
20	417767	4655574	53	409912	4661326
21	417269	4661782	54	413666	4657350
22	408788	4661538	55	416370	4660118
23	417173	4656100	56	418064	4661520
24	409948	4660801	57	408303	4654938
25	415833	4656535	58	414880	4659411

Table 2 Layout *new* : Wind turbine positions coordinates (UTM WGS84 Zone38)

WTG	Easting	Northing	WTG	Easting	Northing
01	416362	4656165	24	408494	4654948
02	415941	4655779	25	408788	4661538
03	418084	4652080	26	417103	4652013
04	415833	4656535	27	417016	4658726
05	416235	4654695	28	412557	4657113
06	418096	4656038	29	414831	4655492
07	416787	4653517	30	417038	4659205
08	417568	4652920	31	414129	4661859
09	418078	4651798	32	412532	4661391
10	416761	4655570	33	412897	4662256
11	414067	4655324	34	412723	4661825
12	410058	4660177	35	413962	4661398
13	416458	4654118	36	413666	4657350
14	412485	4655984	37	414699	4658932
15	417205	4656123	38	414889	4659361
16	417783	4655561	39	409084	4656879
17	415799	4657018	40	409728	4661538
18	414338	4662288	41	413149	4656799
19	412348	4656581	42	415632	4659731
20	409883	4660970	43	409064	4662059
21	408631	4655374	44	409523	4657755
22	408706	4655795	45	409188	4657353
23	417027	4659671	46	409763	4661954

Table 3 Receptors positions coordinates (UTM WGS84 Zone38)

ID	Easting	Northing
P1 Urbnisi	416565	4651912
P2 Ruisi A	415721	4653945
P3 Ruisi B	413260	4655269
P4 Highway	416908	4652303
P5 Breti	409445	4660100
P6 Dirbi	407909	4662330
P7 Dzlevijvari	412127	4661968
P8 Sakasheti	415254	4660228
P9 Arashenda	418510	4656545
P10 Sagholasheni	408475	4657221

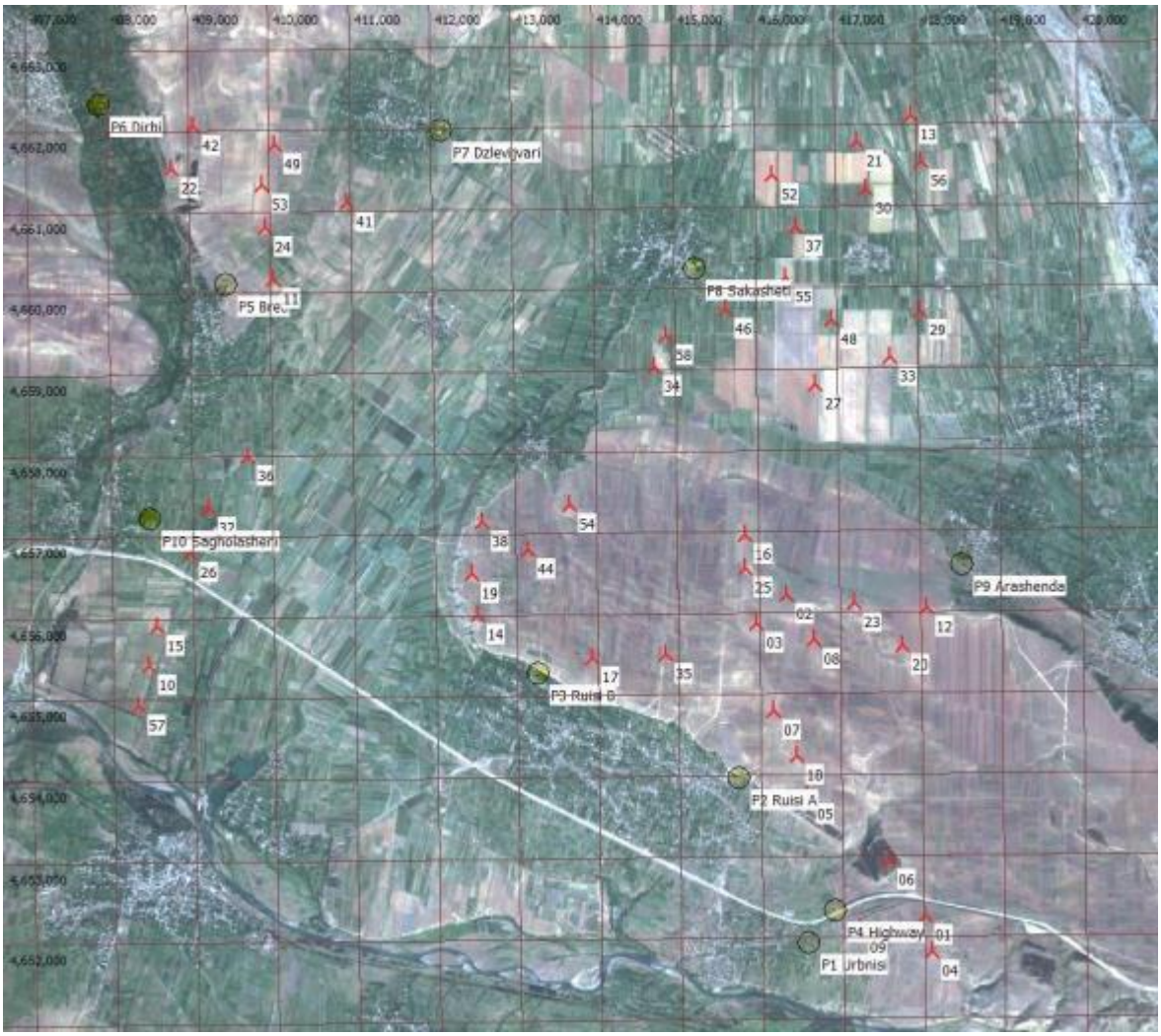


Figure 1 Layout *rejected* : Wind turbines at earth map

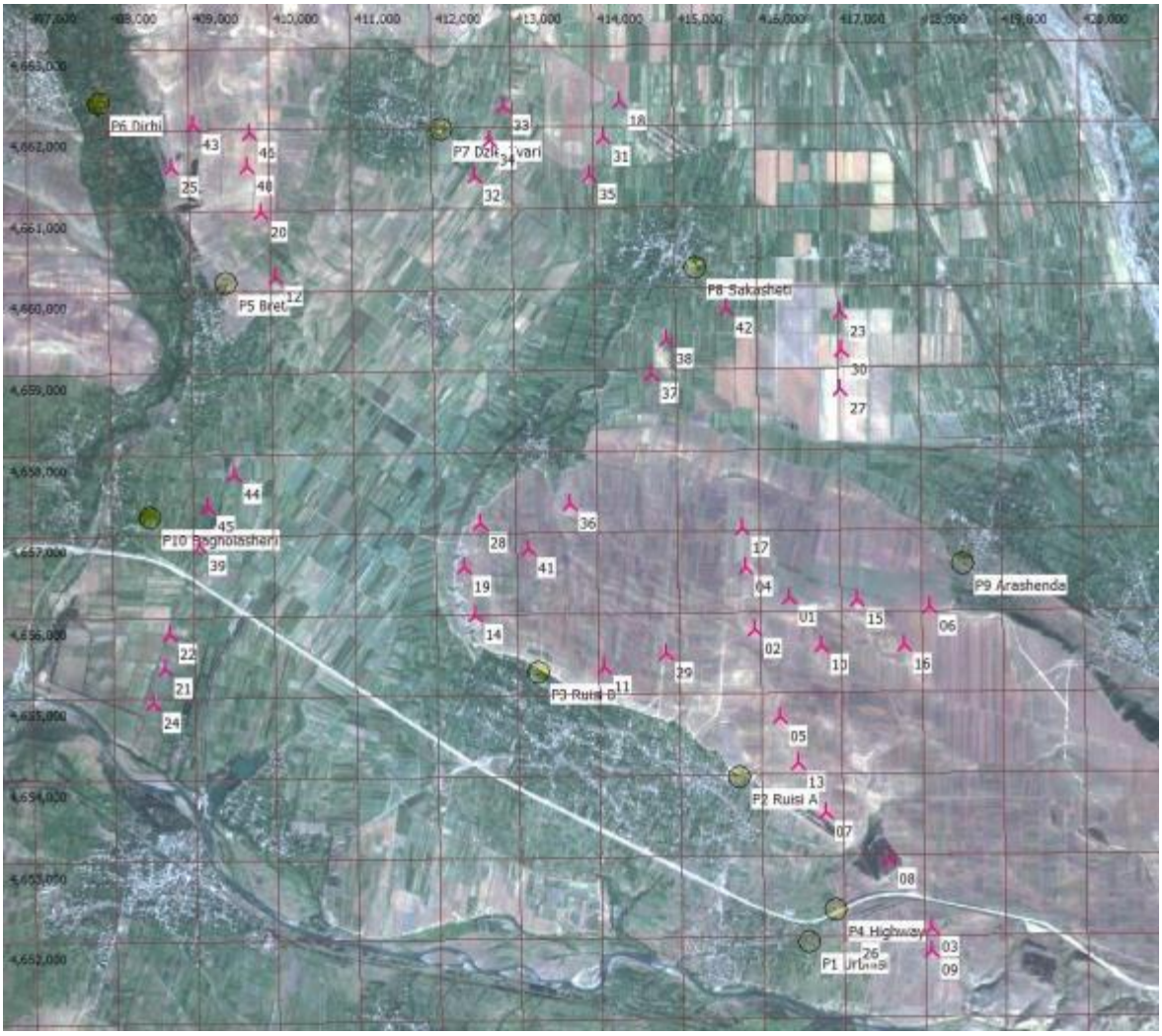


Figure 2 Layout *new* : Wind turbines at earth map

3 CALCULATION OF SHADOW FLICKER

3.1 Methodology and input data

Wind turbines cast the shadow of their rotating blades during periods of bright sunshine. If these shadows are cast on the windows of nearby dwellings, residents may experience a strobe shadow flicker effect inside the house. This effect is particularly pronounced at dawn and dusk.

The purpose of this report is to graphically represent the impact of shadow flicker in terms of modeled maximum shadow hours per year and maximum shadow minutes per day in the vicinity of planed wind farm. SHADOW module of WindPRO 3.6 [1] software package (licensed to Fractal d.o.o. Split) is used to model the „worst-case“ impact in the vicinity of planed wind farm.

Model applied for calculation of shadow flicker impact is conservative, i.e. it is expected that the values achieved during the wind farm operation will be lower than calculated.

Applied model implements worst case scenario:

- receptors installed in all directions (green house),
- disregards the beneficial influence of local vegetation,
- assumes the constant sunny weather from dusk till dawn,
- assumes the constant operation of wind turbines,
- assumes the perpendicular alignment of wind turbine blades between the sun and the receptor.

Calculation is performed for two predefined layouts (**rejected** alternative and new, **selected** configuration). 3D terrain model with contours of 10m equidistance is prepared and used for the calculation purposes.

In order to conduct the calculation, the following steps are implemented:

- identification of wind turbines input data,
- calculation of shadow flicker effects,
- graphical representation of shadow flicker impact.

3.2 Wind turbine parameters

Wind turbine type that would be used for planned wind farm site is not yet determined. One of the considered turbine types is Nordex N163/5.9 h.h. 148m, therefore wind turbine dimensions that correspond to this turbine type are used in calculation:

- hub height: 148.0m,
- rotor diameter: 163m,
- tip height: 229.5m.

3.3 Shadow flicker calculation

3.3.1 Calculation parameters

The following calculation parameters are used:

- minimal angle of the sun from the horizon: 3°,
- daily calculation step: 1 day,
- calculation time-step: 1 minute,
- spatial resolution: 1m,
- window dimensions 1m x 1m, 1m a.g.l., perpendicular to each turbine position,
- receptor (eye) height 1.5m.

Relevant parameter for qualifications of the shadow flicker effects is the influence duration, calculated in hours per year (h/year) and minutes per day (min/day).

Although there are no legal regulations that determine the limits of shadow flicker impact, "Environmental, Health, and Safety Guidelines for Wind Energy" [2] apply the following criteria: *"If it is not possible to locate the wind energy facility/turbines such that neighboring receptors experience no shadow flicker effects, it is recommended that the predicted duration of shadow flicker effects experienced at a sensitive receptor not exceed 30 hours per year and 30 minutes per day on the worst affected day, based on a worst-case scenario".*

3.3.2 Calculation results

Graphical representation of modeled maximum hours per year and maximum minutes per day under the influence of shadow flicker in the vicinity of planed wind farm is given at the following figures.

3.3.3 Layout *previous (rejected alternative)*

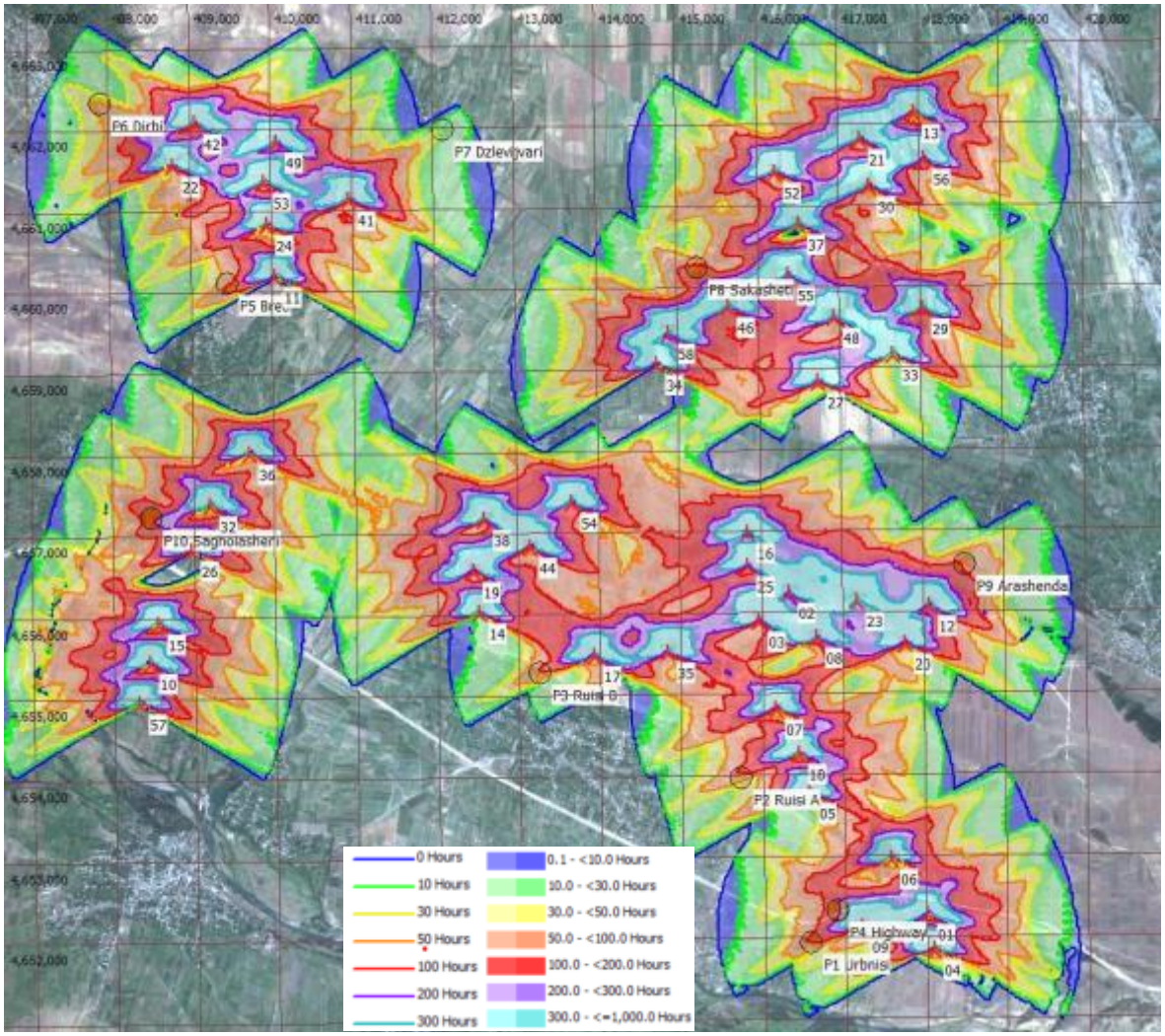


Figure 3 Layout *previous* : graphical representation of modeled maximum hours per year under the influence of shadow flicker in the vicinity of planned wind farm

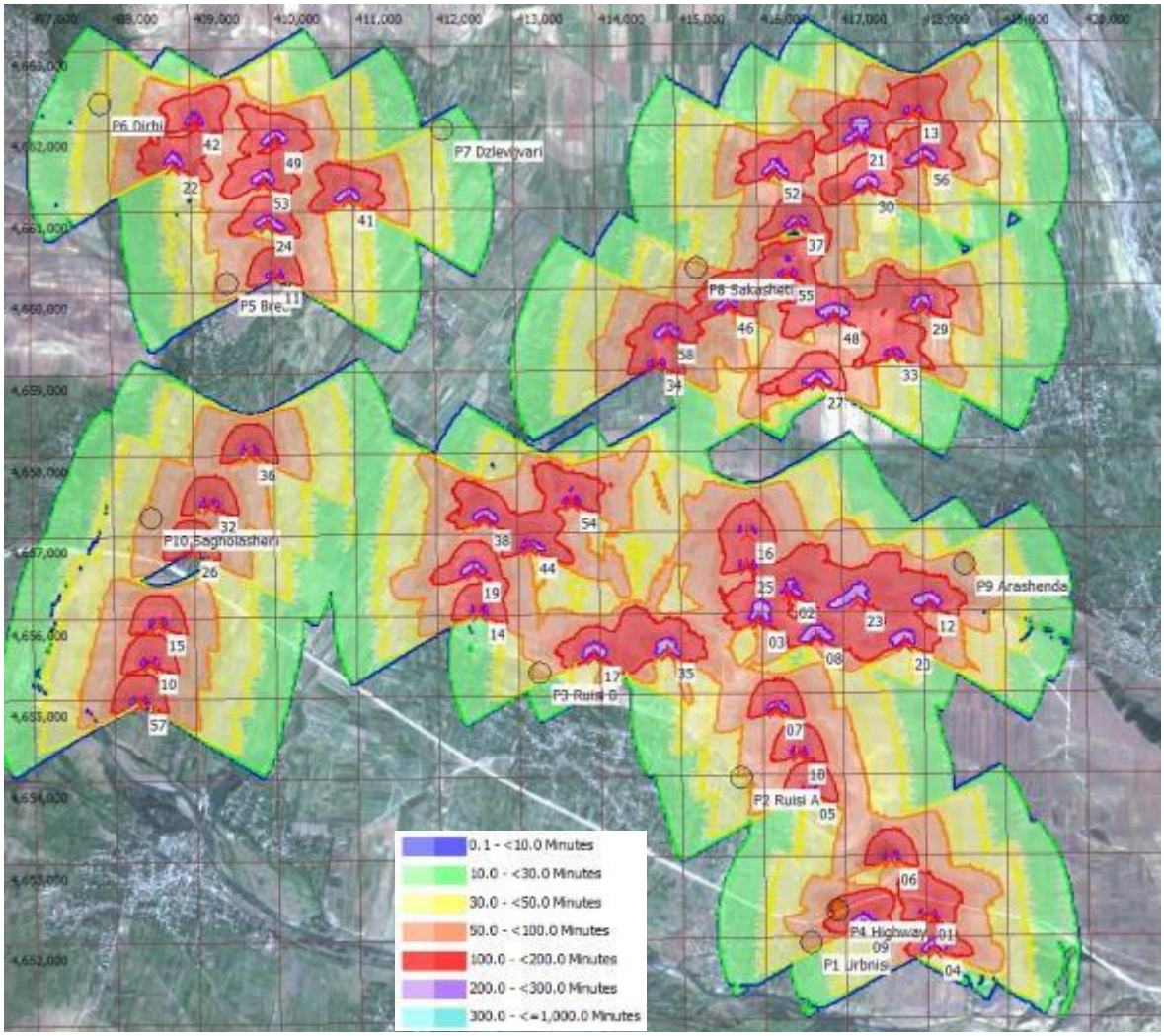


Figure 4 Layout *previous (rejected alternative)*: graphical representation of modeled maximum minutes per day under the influence of shadow flicker in the vicinity of planned wind farm

3.3.4 Layout *new (final configuration)*

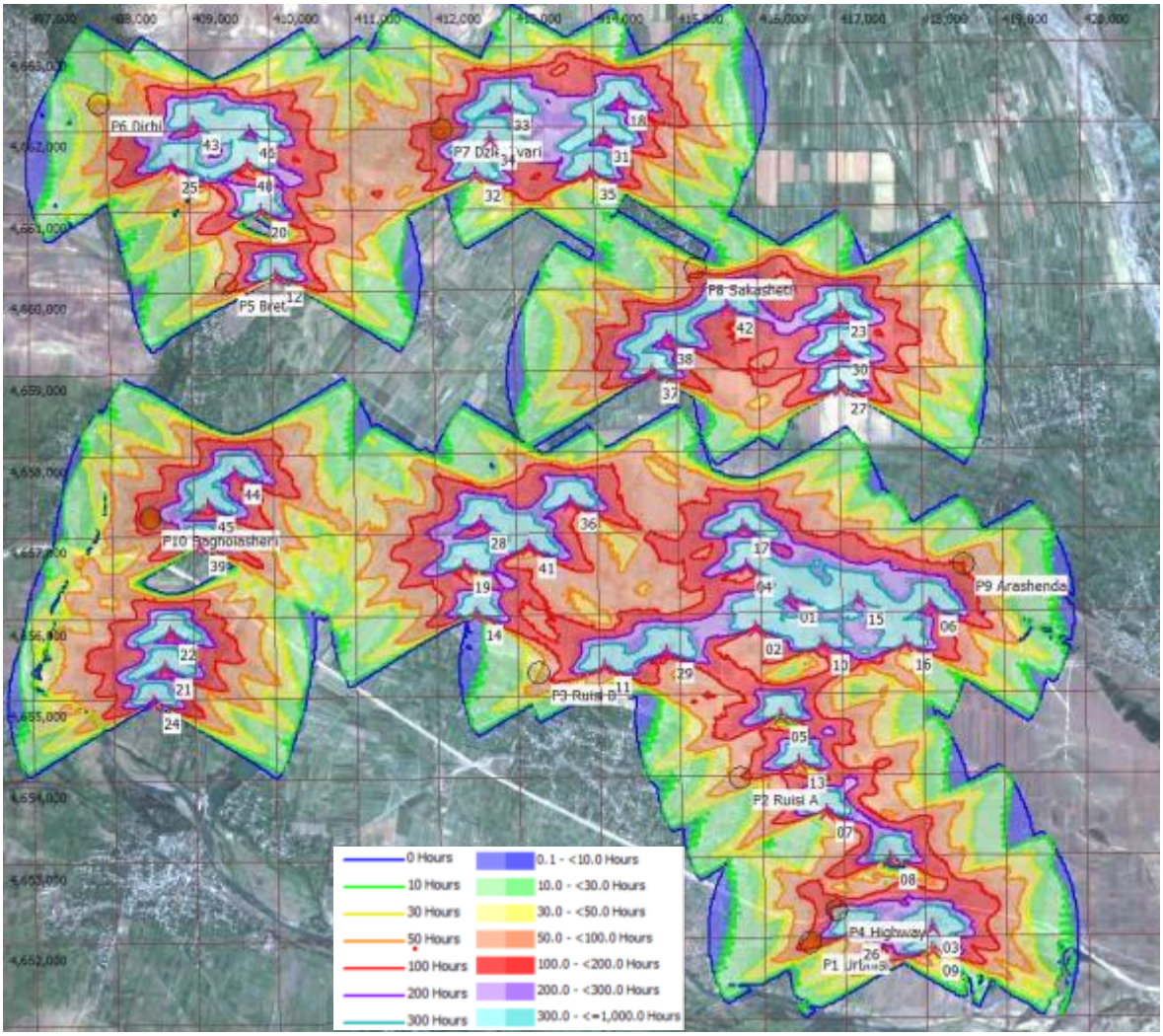


Figure 5 Layout *new (final configuration): graphical representation of modeled maximum hours per year under the influence* of shadow flicker in the vicinity of planned wind farm

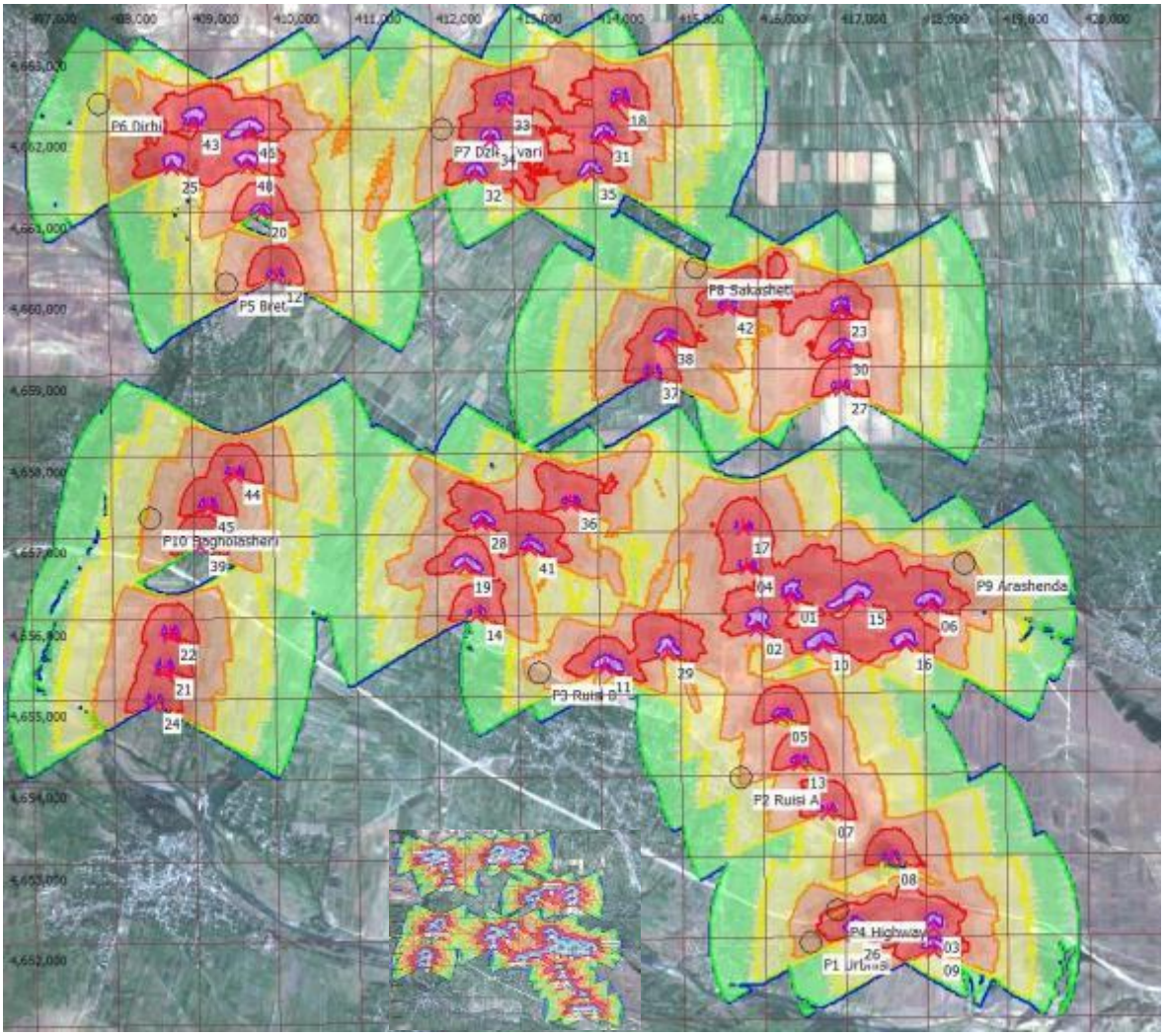


Figure 6 Layout *new (final configuration): graphical* representation of modeled maximum minutes per day under the influence of shadow flicker in the vicinity of planned wind farm

3.3.5 Results for the most exposed receptors

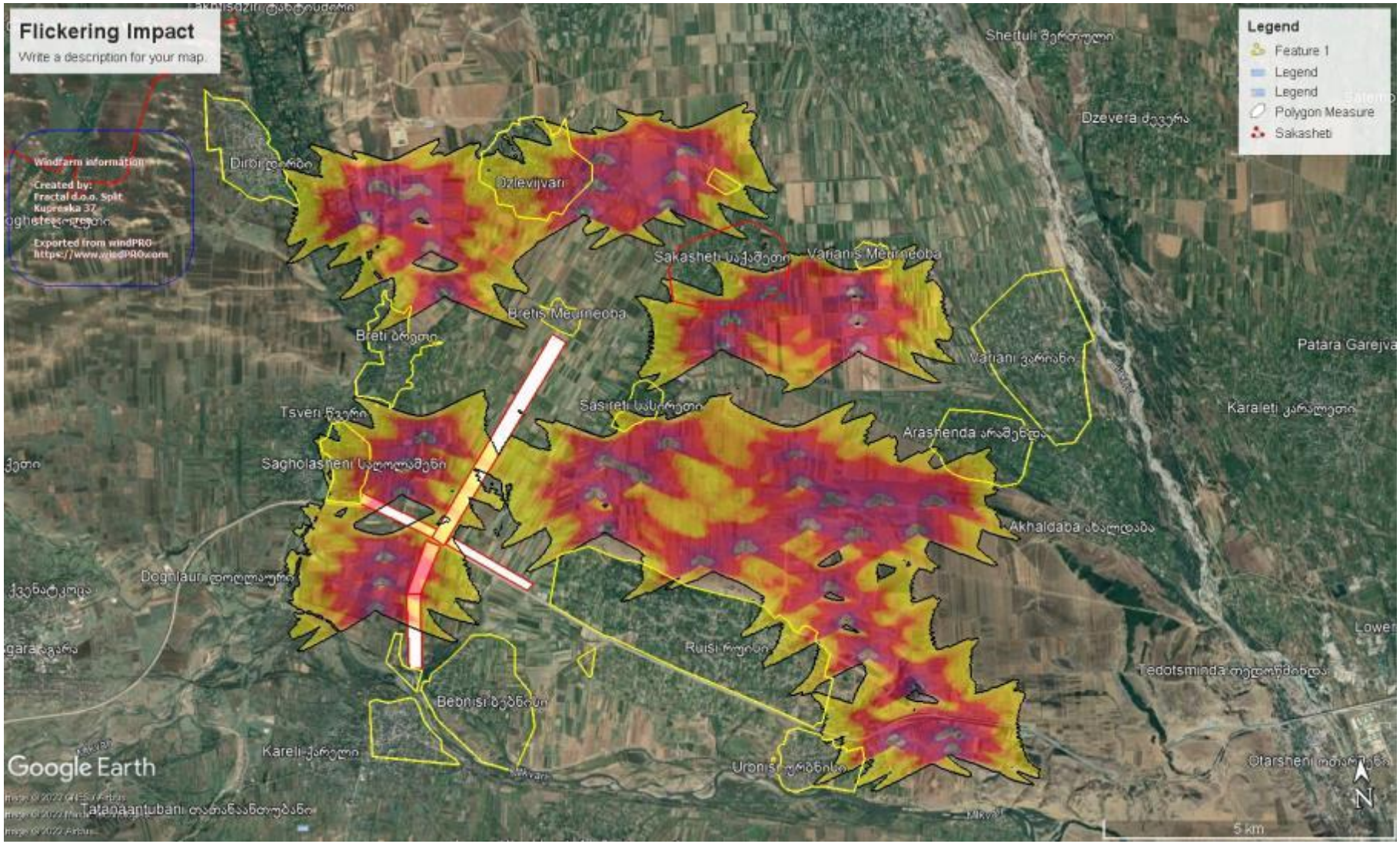
Table 4 Layout *previous* : shadow flicker duration at receptors

	previous	
ID	Hours per year	Max hours per day
P1 Urbnisi	**101:31:00**	**00:59**
P2 Ruisi A	**72:55:00**	**00:48**
P3 Ruisi B	**94:00:00**	**00:57**
P4 Highway	**183:30:00**	**01:59**
P5 Breti	**85:05:00**	**01:02**
P6 Dirbi	**50:40:00**	**00:35**
P7 Dzlevijvari	27:07:00	00:28
P8 Sakasheti	**118:53:00**	**01:02**
P9 Arashenda	**97:49:00**	**00:55**
P10 Sagholasheni	**160:17:00**	**01:00**

Table 5 Layout new : shadow flicker duration at receptors

	new	
ID	Hours per year	Max hours per day
P1 Urbnisi	**142:20:00**	**01:08**
P2 Ruisi A	**98:07:00**	**00:51**
P3 Ruisi B	**50:23:00**	**01:05**
P4 Highway	**251:07:00**	**01:57**
P5 Breti	**82:35:00**	**01:00**
P6 Dirbi	**50:39:00**	**00:35**
P7 Dzlevijvari	**152:36:00**	**00:59**
P8 Sakasheti	**65:19:00**	**01:02**
P9 Arashenda	**101:54:00**	**00:57**
P10 Sagholasheni	**140:07:00**	**00:54**

Figure 7. graphical representation of medium and severe shadow flicker impacts on residential areas



4 CONCLUSION

Calculating the shadow flicker impact in the vicinity of planed WF Imereti using the SHADOW module of WindPRO 3.6 software package, considering the worst-case scenario, graphical representation of these phenomena is obtained. As it can be observed, for the *previous* and both for the *new* layout calculated worst scenario results at most exposed receptors exceed the limits of informal guidelines (30 hours per year and 30 minutes per day on the worst affected day) at al selected nearby receptors.

Fig. 7 shows in more details how the residential areas in the vicinity of villages are affected for the reviewed worst case scenario (selected configuration of turbines). The yellow zone show the marginal level of flickering (more than 30 hours per year, less than 50 hours), while the red zone shows high levels – 100hours per year. The residential areas are shown as yellow and red contours.

In the Table 6. the flickering impacts are summarized by villages, residential areas and houses and the turbines having major input in these impacts are marked.

Table 6. Impacts by Receptors and Turbines

Villages	% of residential area falling within the medium flickering impact zone 30 – 50 hours/year	% of residential area falling within the high flickering impact zone 100 hours/year	No of Turbines with most severe impact	Comments
Vill. Ruisi;	13% 208 houses	1.12% 19 houses	11; 29; 05; 13; 07;	Despite the fact that affected residential land area is only 13%, the number of affected houses is significant. About 208 houses fall in medium impact zone and 19 houses within the severe impact zone. The major input is provided by turbines 11; 29; 05 and 13;
Vill. Sagolasheni;	96% 75 houses	24% 15 houses	44; 45; 39;	% of affected residential land and number of affected houses is high. Major impacts are related to turbines No 39 and 45;
Vill. Breti;	11% 26 houses	2% 1house	12; 20;	% of severely affected residential land and number of severely affected houses is low. Major impacts are related to turbine No 12;
Vill Bretis Meurneoba	0	0	-	
Vill. Sasireti;	32% 13 houses	3.5% 1 house	28; 36; 37	% of severely affected residential land and number of severely affected houses is low. Major impacts are related to turbine No 36;
Vill. Dirbi;	0.5% 0 houses	0 0 houses	25; 43;	The impact is low
Vill. Dzvelijvari;	87% 128 houses	30% 16 houses	32; 33; 34;	% of affected residential land and number of affected houses is high. Major impacts are related to turbines No 32; 33; 34;

Vill. Sakasheti;	41% 67 houses	25% 2 houses	37; 38; 42;	% of severely affected residential land is high nut number of severely affected houses is low. The most part of the affected residential land is a reserve for future development and no houses are located there at present. Major impacts are related to turbine No 38; 42;
Vill. Variani;	0	0	-	
Vill. Varianis Meurneoba	21% 14 houses	1% 0 houses	23;	% of severely affected residential land and number of severely affected houses is low. Major impacts are related to turbine No 23;
Vill. Arashenda.	17% 75 houses	3% 3 houses	06; 15; 16;	% of severely affected residential land and number of severely affected houses is low. Major impacts are related to turbines No 06; 16;
Vill. Urbnisi;	21% 13 houses	4.5% 3 houses	26;	% of severely affected residential land and number of severely affected houses is low. Major impacts are related to turbines No 26;
Vill. Bebnisi;	0	0	-	
Kareli.	0	0	-	

Recommendations for mitigation and compensation:

1. **Removing the turbines with the highest flickring impact.** The final number of turbines and configuration is still under consideration. In case if finally it is planned to reduce number of WTG positions then WTGs with the largest SF influence could be removed (results of total amount of flickering caused by each WTG are presented in the calculation appendix).

2. **Temporary Shutdowns of turbines.** JSC Wind Power takes commitement to develop a schedule for shutting down turbines to achieve acceptable S/F impact. Precise modeling for developing the schedule is not possible at this stage, as final precise locations, number of turbines and orientation, as well as particular models of turbines are not yet determined.The schedule will be developed during the first year of operations, based on actual monitoring data. As a preferable option the company plans to use automated “shadow flicker protection system”. However, final decision will be taken during consultations with the suppliers.

3. **Compensations.** In parallel with the schedule for shutting down turbines, the JCS Wind Power will develop compensation packages to off set the residual flickering impacts. It is assumed that the schedule for shutting down turbines will allow to significantly reduce the severe flickering impacts, however, the certain residual impact of low and medium magnitude may still remain unmitigated. On a basis of monitoring data, permanent consultations with the residents of affected villages and grievances collected through GRM, the affected residents eligible for compensation will be determined. The amounts for compensation will be determined based on consultations and negotiation with the affected residents.

REFERENCES

[1] WindPRO, Version 3.6, EMD International A/S

[2] Environmental, Health, and Safety Guidelines for Wind Energy, World bank group, August 2015

Appendix 2 – WF Gori Ruisi Alternative (Rejected)

Project:
WF Gori

Licensed user:
Fractal d.o.o. Split
Kupreska 37
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+38591 702270
Eugen Mudnic / eugen.mudnic@fractal-res.com
Calculated:
30/09/2022 16:13/3.6.355

SHADOW - Main Result

Calculation: SF Gori previous

Assumptions for shadow calculations

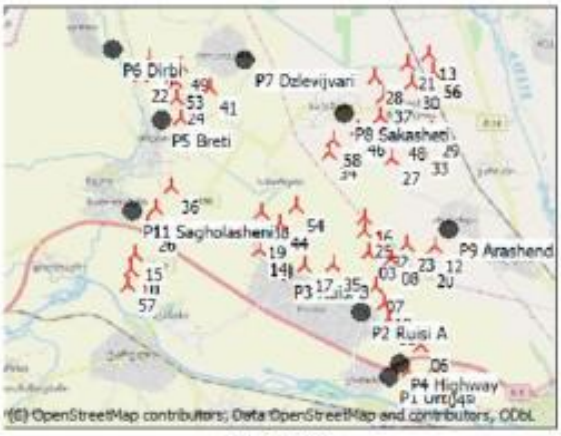
Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window.
The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours
Receptor grid resolution: 1.0 m

All coordinates are in
UTM (north)-WGS84 Zone: 38



Scale 1:200,000
New WTG
Shadow receptor

WTGs

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
01	418,012	4,652,230	760.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
02	416,334	4,656,201	840.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
03	415,967	4,655,857	810.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
04	418,092	4,651,798	730.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
05	416,566	4,653,746	740.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
06	417,568	4,652,920	740.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
07	416,168	4,654,777	771.6	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
08	416,673	4,655,645	800.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
09	417,201	4,652,097	700.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
10	408,435	4,655,424	660.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
11	410,041	4,660,165	714.3	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
12	418,071	4,656,033	780.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
13	417,945	4,662,101	723.8	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
14	412,506	4,655,997	716.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
15	408,548	4,655,905	661.6	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
16	415,834	4,656,953	765.6	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
17	413,919	4,655,453	746.6	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
18	416,438	4,654,221	750.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
19	412,449	4,656,513	720.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
20	417,767	4,655,574	778.7	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
21	417,269	4,661,782	722.2	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
22	408,788	4,661,538	723.7	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
23	417,173	4,656,100	799.7	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
24	409,948	4,660,801	722.3	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
25	415,833	4,656,535	800.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
26	408,968	4,656,812	670.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
27	416,728	4,658,801	700.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
28	416,218	4,661,384	722.3	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
29	418,031	4,659,687	701.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
30	417,376	4,661,200	717.5	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
32	409,203	4,657,357	672.3	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
33	417,655	4,659,120	698.2	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
34	414,740	4,659,029	710.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
35	414,831	4,655,492	750.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
36	409,701	4,657,994	678.7	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
37	416,498	4,660,737	716.8	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
38	412,583	4,657,145	718.1	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
41	410,957	4,661,103	720.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
42	409,067	4,662,061	733.8	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
44	413,149	4,656,799	722.3	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
46	415,632	4,659,731	710.0	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
48	416,934	4,659,587	704.5	NORDEX N163/5.9 5900 163.0 !O! hub\es		NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7

To be continued on next page...

Project:
WF Gori

Licensed user:
Fractal d.o.o. Split
Kupreska 37
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+38591 702270
Eugen Mudnic / eugen.mudnic@fractal-res.com
Calculated:
30/09/2022 16:13/3.6.355

SHADOW - Main Result

Calculation: SF Gori previous

...continued from previous page

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
49	410,065	4,661,823	730.0	NORDEX N163/5.9 5900 163.0 !O! hub	Yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
52	416,218	4,661,384	722.3	NORDEX N163/5.9 5900 163.0 !O! hub	Yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
53	409,912	4,661,326	726.4	NORDEX N163/5.9 5900 163.0 !O! hub	Yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
54	413,666	4,657,350	720.0	NORDEX N163/5.9 5900 163.0 !O! hub	Yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
55	416,370	4,660,118	710.4	NORDEX N163/5.9 5900 163.0 !O! hub	Yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
56	418,064	4,661,520	718.2	NORDEX N163/5.9 5900 163.0 !O! hub	Yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
57	408,303	4,654,938	653.2	NORDEX N163/5.9 5900 163.0 !O! hub	Yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
58	414,880	4,659,411	710.0	NORDEX N163/5.9 5900 163.0 !O! hub	Yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7

Shadow receptor-Input

No.	Name	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
P1	Urbnisi	416,565	4,651,912	663.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P11	Sagholasheni	408,475	4,657,221	672.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P2	Ruisi A	415,721	4,653,945	698.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P3	Ruisi B	413,260	4,655,269	708.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P4	Highway	416,908	4,652,303	680.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P5	Breti	409,445	4,660,100	709.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P6	Dirbi	407,909	4,662,330	700.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P7	Dzlevjvari	412,127	4,661,968	726.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P8	Sakasheti	415,254	4,660,228	717.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P9	Arashenda	418,510	4,656,545	698.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0

Calculation Results

Shadow receptor

No.	Name	Shadow, worst case Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
P1	Urbnisi	101:31	147	0:59
P11	Sagholasheni	160:17	216	1:00
P2	Ruisi A	72:55	120	0:48
P3	Ruisi B	94:00	134	0:57
P4	Highway	183:30	147	1:59
P5	Breti	85:05	109	1:02
P6	Dirbi	50:40	108	0:35
P7	Dzlevjvari	27:07	66	0:28
P8	Sakasheti	118:53	202	1:02
P9	Arashenda	97:49	146	0:55

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]
01	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (106)	33:56
02	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (107)	0:00
03	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (108)	0:00
04	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (109)	25:13
05	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (110)	29:28
06	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (111)	0:00
07	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (112)	0:00
08	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (113)	0:00
09	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (114)	231:54
10	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (115)	0:00
11	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (116)	85:05
12	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (117)	85:56
13	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (118)	0:00
14	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (119)	0:00
15	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (120)	0:00
16	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (121)	0:00
17	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (122)	83:17
18	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (123)	43:27

To be continued on next page...

Project:
WF Gori

Licensed user:
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Calculated:
30/09/2022 16:13/3.6.355

SHADOW - Main Result

Calculation: SF Gori previous

...continued from previous page

No.	Name	Worst case [h/year]
19	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (124)	0:00
20	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (125)	0:00
21	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (126)	0:00
22	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (127)	34:24
23	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (128)	11:53
24	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (129)	0:00
25	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (130)	0:00
26	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (131)	98:46
27	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (132)	0:00
28	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (133)	0:00
29	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (134)	0:00
30	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (135)	0:00
32	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (136)	61:31
33	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (137)	0:00
34	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (138)	0:00
35	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (139)	10:43
36	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (140)	0:00
37	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (141)	35:07
38	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (142)	0:00
41	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (143)	27:07
42	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (144)	16:16
44	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (145)	0:00
46	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (146)	65:19
48	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (147)	0:00
49	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (148)	0:00
52	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (149)	0:00
53	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (150)	0:00
54	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (151)	0:00
55	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (152)	18:27
56	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (153)	0:00
57	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (154)	0:00
58	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (155)	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneous

Appendix 2 – WF Gori Final

Project:
WF Gori

Licensed user:
Fractal d.o.o. Split
Kupreska 37
creac crea
+38591 702270
Eugen Mudnic / eugen.mudnic@fractal-res.com
Calculated:
30/09/2022 16:07/3.6.355

SHADOW - Main Result

Calculation: SF Gori new

Assumptions for shadow calculations

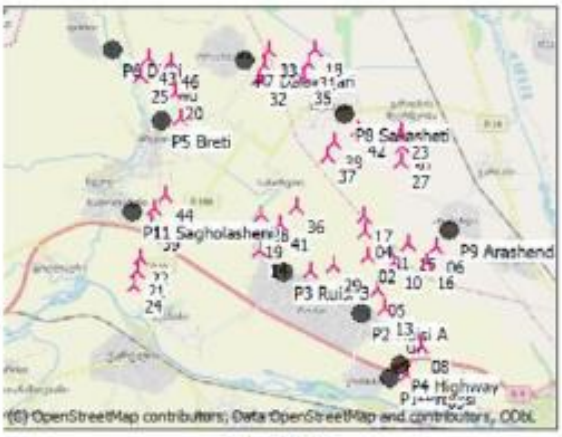
Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

The calculated times are "worst case" given by the following assumptions:
The sun is shining all the day, from sunrise to sunset
The rotor plane is always perpendicular to the line from the WTG to the sun
The WTG is always operating

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window.
The ZVI calculation is based on the following assumptions:
Height contours used: Height Contours
Receptor grid resolution: 1.0 m

All coordinates are in
UTM (north)-WGS84 Zone: 38



Scale 1:200,000
New WTG
Shadow receptor

WTGs

	Easting	Northing	Z [m]	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated [kW]	Rotor diameter [m]	Hub height [m]	Shadow data Calculation distance [m]	RPM [RPM]
01	416,362	4,656,165	840.0	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
02	415,941	4,655,779	806.6	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
03	418,084	4,652,080	756.2	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
04	415,833	4,656,535	800.0	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
05	416,235	4,654,695	770.0	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
06	418,096	4,656,038	780.0	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
07	416,787	4,653,517	740.0	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
08	417,568	4,652,920	740.0	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
09	418,078	4,651,798	730.0	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
10	416,761	4,655,570	790.6	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
11	414,067	4,655,324	750.0	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
12	410,058	4,660,177	714.3	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
13	416,458	4,654,118	745.0	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
14	412,485	4,655,984	714.4	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
15	417,205	4,656,123	796.4	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
16	417,783	4,655,561	778.1	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
17	415,799	4,657,018	760.0	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
18	414,338	4,662,288	731.2	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
19	412,348	4,656,581	714.9	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
20	409,883	4,660,970	723.8	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
21	408,631	4,655,374	660.0	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
22	408,706	4,655,795	660.2	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
23	417,027	4,659,671	705.1	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
24	408,494	4,654,948	652.5	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
25	408,788	4,661,538	723.7	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
26	417,103	4,652,013	688.6	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
27	417,016	4,658,726	697.7	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
28	412,557	4,657,113	718.7	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
29	414,831	4,655,492	750.0	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
30	417,038	4,659,205	700.3	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
31	414,129	4,661,859	726.7	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
32	412,532	4,661,391	719.4	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
33	412,897	4,662,256	729.4	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
34	412,723	4,661,825	724.1	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
35	413,962	4,661,398	721.8	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
36	413,666	4,657,350	720.0	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
37	414,699	4,658,932	710.0	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
38	414,889	4,659,361	710.0	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
39	409,084	4,656,879	670.0	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
40	409,728	4,661,538	727.9	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
41	413,149	4,656,799	722.3	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
42	415,632	4,659,731	710.0	NORDEX N163/5.9 5900 163.0 !O! hub	yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7

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Project:
WF Gori

Licensed user:
Fractal d.o.o. Split
Kupreska 37
creac crea
+38591 702270
Eugen Mudnic / eugen.mudnic@fractal-res.com
Calculated:
30/09/2022 16:07/3.6.355

SHADOW - Main Result

Calculation: SF Gori new

...continued from previous page

	Easting	Northing	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
			[m]					[kW]	[m]	[m]	[m]	[RPM]
43	409,064	4,662,059	733.8	NORDEX N163/5.9 5900 163.0 !O! hub:	Yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
44	409,523	4,657,755	676.0	NORDEX N163/5.9 5900 163.0 !O! hub:	Yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
45	409,188	4,657,353	672.3	NORDEX N163/5.9 5900 163.0 !O! hub:	Yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7
46	409,763	4,661,954	730.0	NORDEX N163/5.9 5900 163.0 !O! hub:	Yes	NORDEX	N163/5.9-5,900	5,900	163.0	148.0	1,786	10.7

Shadow receptor-Input

No.	Name	Easting	Northing	Z	Width	Height	Elevation a.g.l.	Slope of window	Direction mode	Eye height (ZVI) a.g.l.
				[m]	[m]	[m]	[m]	[°]		[m]
P1 Urbnisi	P1 Urbnisi	416,565	4,651,912	663.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P11 Sagholasheni	P10 Sagholasheni	408,475	4,657,221	672.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P2 Ruisi A	P2 Ruisi A	415,721	4,653,945	698.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P3 Ruisi B	P3 Ruisi B	413,260	4,655,269	708.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P4 Highway	P4 Highway	416,908	4,652,303	680.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P5 Breti	P5 Breti	409,445	4,660,100	709.9	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P6 Dirbi	P6 Dirbi	407,909	4,662,330	700.0	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P7 Dzlevjvari	P7 Dzlevjvari	412,127	4,661,968	726.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P8 Sakasheti	P8 Sakasheti	415,254	4,660,228	717.2	1.0	1.0	1.0	90.0	"Green house mode"	2.0
P9 Arashenda	P9 Arashenda	418,510	4,656,545	698.4	1.0	1.0	1.0	90.0	"Green house mode"	2.0

Calculation Results

Shadow receptor

No.	Name	Shadow, worst case Shadow hours per year [h/year]	Shadow days per year [days/year]	Max shadow hours per day [h/day]
P1 Urbnisi	P1 Urbnisi	142:20	176	1:08
P11 Sagholasheni	P10 Sagholasheni	140:07	215	0:54
P2 Ruisi A	P2 Ruisi A	98:07	155	0:51
P3 Ruisi B	P3 Ruisi B	50:23	68	1:05
P4 Highway	P4 Highway	251:07	189	1:57
P5 Breti	P5 Breti	82:35	110	1:00
P6 Dirbi	P6 Dirbi	50:39	107	0:35
P7 Dzlevjvari	P7 Dzlevjvari	152:36	217	0:59
P8 Sakasheti	P8 Sakasheti	65:19	76	1:02
P9 Arashenda	P9 Arashenda	101:54	147	0:57

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]
01	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (2)	0:00
02	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (3)	0:00
03	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (4)	27:19
04	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (5)	0:00
05	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (6)	0:00
06	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (7)	89:26
07	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (8)	18:35
08	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (9)	0:00
09	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (10)	25:46
10	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (11)	0:00
11	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (12)	40:44
12	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (13)	82:35
13	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (14)	79:32
14	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (15)	0:00
15	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (16)	12:28
16	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (17)	0:00
17	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (18)	0:00
18	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (19)	0:00
19	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (20)	0:00
20	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (21)	0:00
21	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (22)	0:00

To be continued on next page...

Project:
WF Gori

Licensed user:
Fractal d.o.o. Split
Kupreska 37
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+38591 702270
Eugen Mudnic / eugen.mudnic@fractal-res.com
Calculated:
30/09/2022 16:07/3.6.355

SHADOW - Main Result

Calculation: SF Gori new

...continued from previous page

No.	Name	Worst case [h/year]
22	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (23)	0:00
23	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (24)	0:00
24	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (25)	0:00
25	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (26)	34:24
26	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (27)	342:41
27	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (28)	0:00
28	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (29)	0:00
29	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (30)	10:43
30	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (31)	0:00
31	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (32)	0:00
32	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (33)	29:48
33	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (34)	63:59
34	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (35)	58:49
35	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (36)	0:00
36	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (37)	0:00
37	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (38)	0:00
38	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (39)	0:00
39	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (40)	54:46
40	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (41)	0:00
41	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (42)	0:00
42	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (43)	65:19
43	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (44)	16:15
44	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (45)	20:42
45	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (46)	64:39
46	NORDEX N163/5.9 5900 163.0 !O! hub: 148.0 m (TOT: 229.5 m) (47)	0:00

Total times in Receptor wise and WTG wise tables can differ, as a WTG can lead to flicker at 2 or more receptors simultaneously and/or receptors may receive flicker from 2 or more WTGs simultaneous

Annex 9. Visual Impact Modelling

Landscape and Visual Impacts

Construction Phase

Construction works will cause certain visual changes in the landscape because the arrangement of construction sites, operation of building machinery and stockpiling of building materials will be required. In any case, this impact will be localized and temporary. Permanent impact will be connected only to permanent infrastructure of the Project. Visual impact could be described considering the layout of project sites regarding visual receptors, that is if sites with modified landscape are within their views.

Only residents of impacted villages will be receptors during construction works when they move along access roads. The impact will have limited scale and temporal character, and will not exceed typical impacts that occur from common infrastructural development/ maintenance works

In terms of landscape impact, the effect caused by forest felling would be of importance. We do not have forests in the project area and the impact on forests is limited. The only area where the felling of trees will take place is the turbine mast T08, which falls within the artificial pine forest. However, since complete cleaning of the pine trees in the area is not planned and only one mast and access roads are subject to cleaning, this impact will be negligible and will be compensated by appropriate compensatory measures (it is proposed to plant three new trees instead of each cut down on the adjacent territory or on the territory agreed with the municipality and the Ministry of Environment Protection and agriculture. In addition, the forest habitat rehabilitation program will be implemented, which will contribute to the restoration of the Grove damaged and aesthetically degraded by Wood parasites.

Operation stage

Visual change at the stage of operation is expressed mainly by the presence of WPP turbines and, to some extent-other infrastructure facilities (substation; office).

The visibility map is generated in the GIS-software Global Mapper (version 20.1.1), using a view shed calculation tool. With this tool a view shed analysis is performed based on loaded elevation grid data, selected turbine positions, transmitter height of 230 m above ground and receiver height of 1.8 m above ground. A view radius of 20 kilometers was used, and a resolution of 25x25 m. The visibility was calculated for each turbine individually, then combined by counting overlapping layers in each grid point. The results were exported and used in the GIS-software QGIS for generation of the map with explaining text.

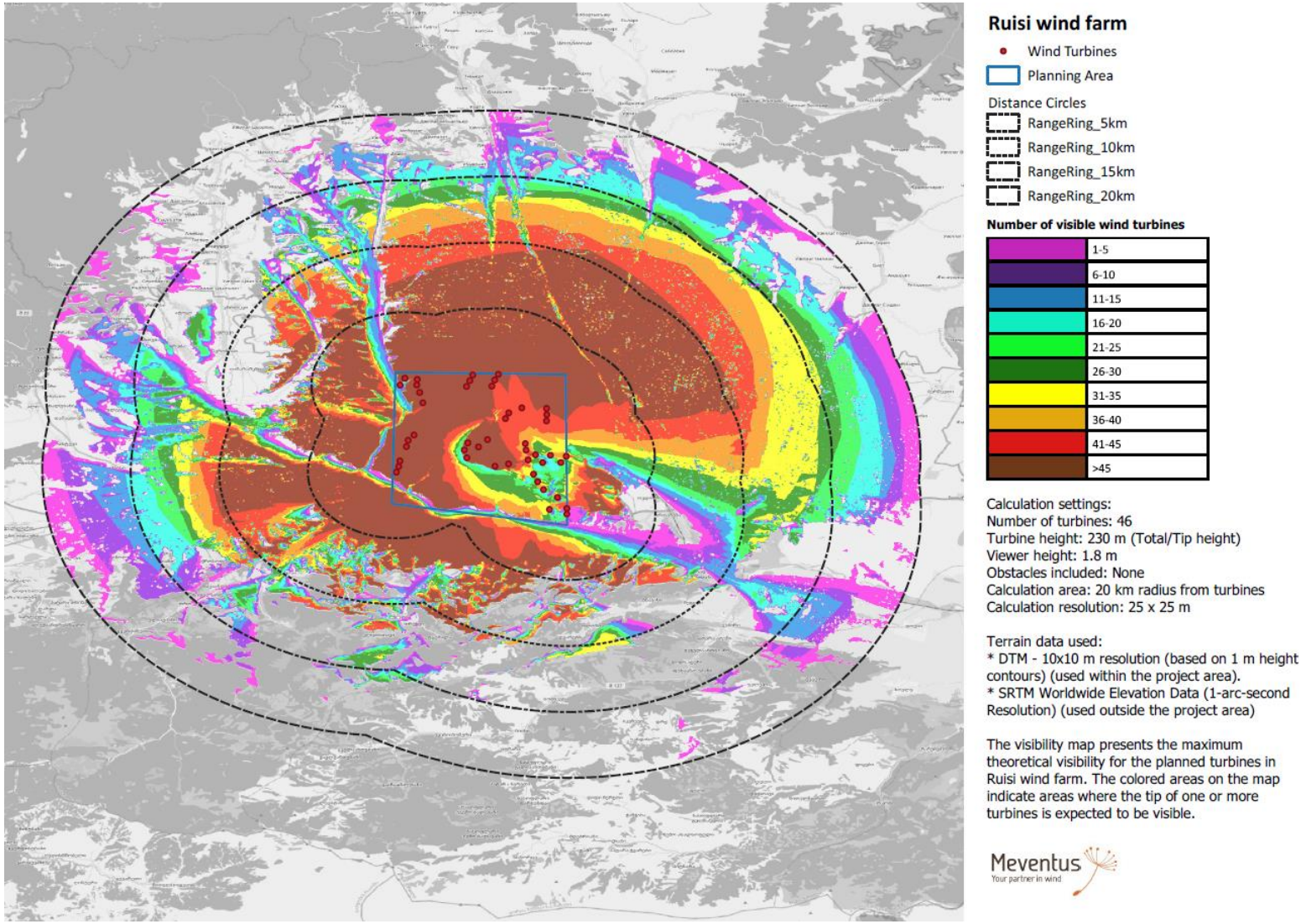


Figure The visibility map

A visibility map presenting the maximum theoretical visibility for the planned turbines (L22e – 46 turbines with 230 m total height) in Ruisi wind farm. The map is calculated based on a generated terrain grid with 10 m resolution within the planning area (this dataset is based on 1m height contours provided by the customer) and the SRTM-dataset with 1-arc-second resolution outside this area. The turbine visibility is calculated for an area up to 20 km from each turbine and the resolution of the map is 25x25m. Note that no obstacles are included in the calculation (e.g. forest).

Turbine visualizations based on Google Earth views are included for the provided 8 positions within and close to the project area.

Vis P1 Highway-	419386,	4652231
Vis P2 Highway-	417015,	4652413
Vis P3 Highway-	412516,	4654155
Vis P4 Highway-	408370,	4656789
Vis P5 Ruisi-	413066,	4655179
Vis P6 Breti-	409448,	4659189
Vis P7 Dzlevijvari-	411322	,4661668
Vis P8 Variani-	419175,	4658692

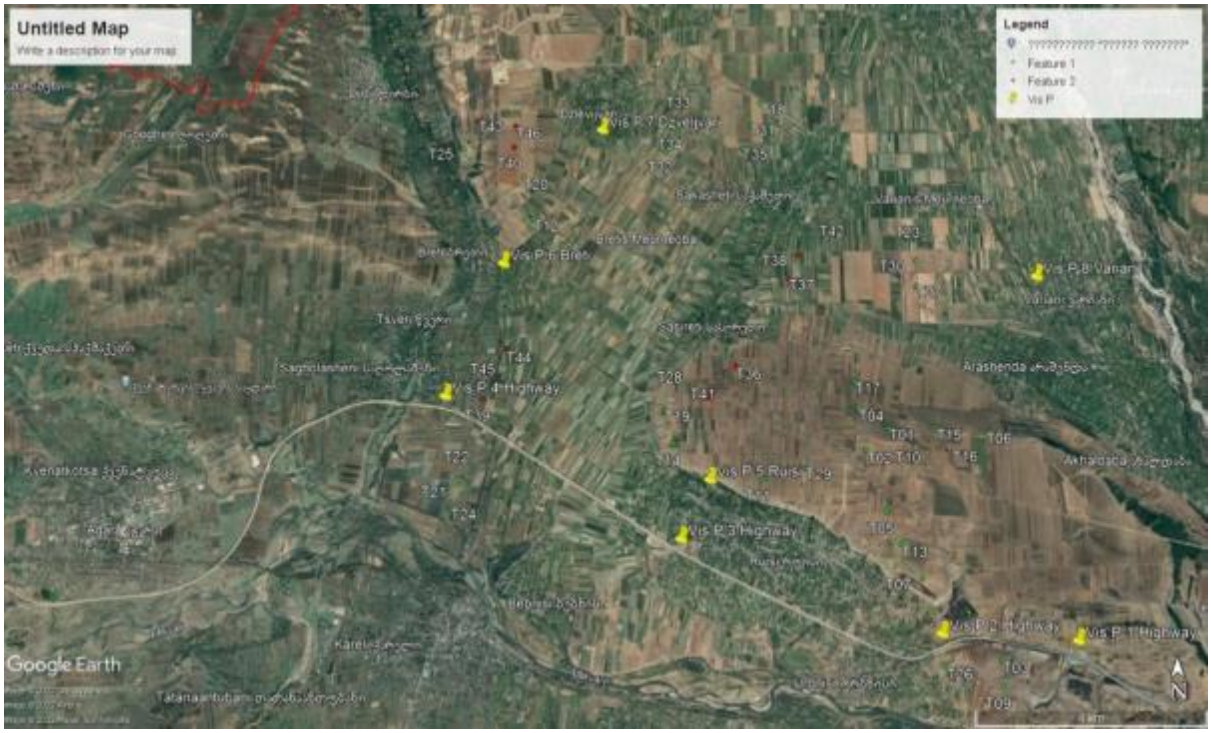


Figure View Points for Visualisation

The layout used for the visualizations is L22e (46 x N163 – 5.9MW – 148m HH).

The 6 existing turbines in the Gori wind farm are also seen in the background in some of the visualizations. As turbines are visible in several directions from each of the viewpoints, multiple visualizations are included for each position. The turbines are mainly facing east or west in the visualizations, as these are the prevailing wind directions. However, for some of the positions also are included included visualizations where the turbines are facing in directions opposite to this.

For the naming of the visualizations, the positions are numbered from VP1 (ViewPoint1) to VP8 and then there is a numbering of the visualization for each specific viewpoint.

Wind turbines will be noticeable both from the nearest settlements (village. Ruisi, Aradeti, Tsveri, Variani settlement, etc.), as well as from a relatively long distance - mainly on the Ruisi districts of the international highway (from Gori tunnel to Agara section). Due to the peculiarities of the terrain - most of the turbine masts will not be visible from the highway at all. Only part of the turbines will be visible on Ruisi sections of the track and in essence, this view does not differ substantially from the view of Gori WPP, which directly borders the project area. Practically, Gori wind turbine landscape will be transformed into new WPP turbine landscape. The Georgian population has got used to the landscape of Gori WPP and it does not cause negative associations.

Figures below shows how Ruisi WPP turbines appear from different locations.

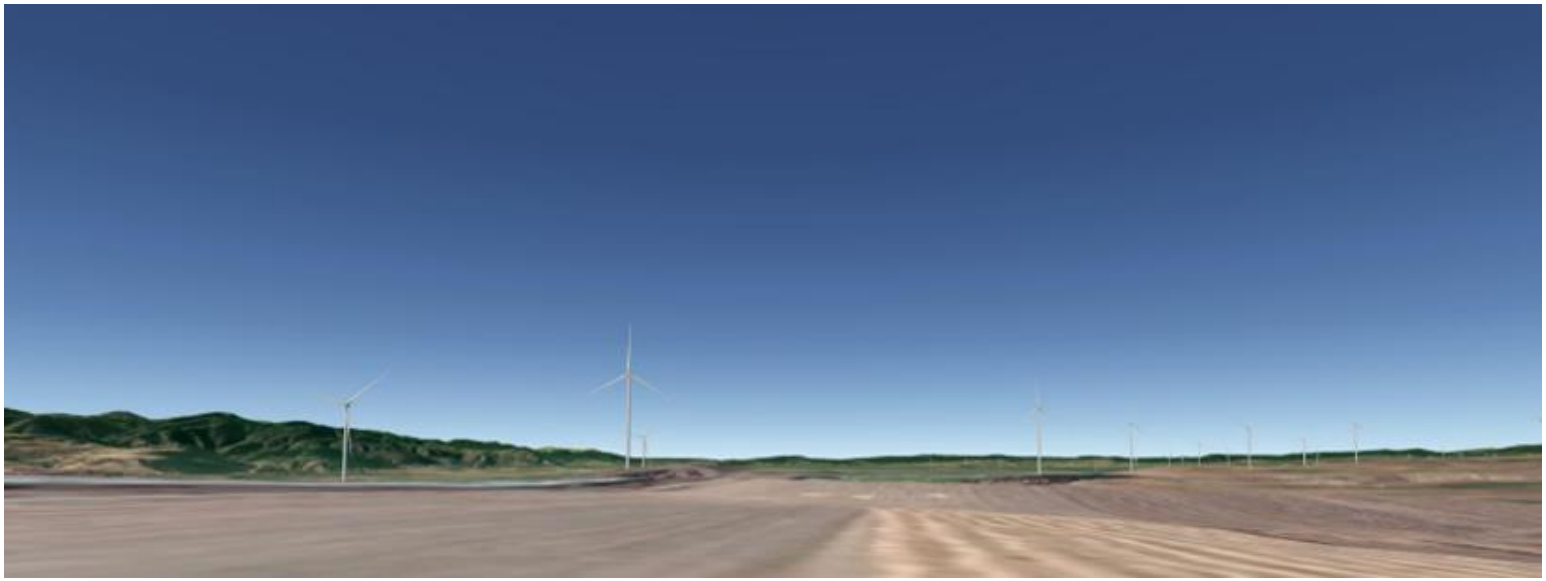
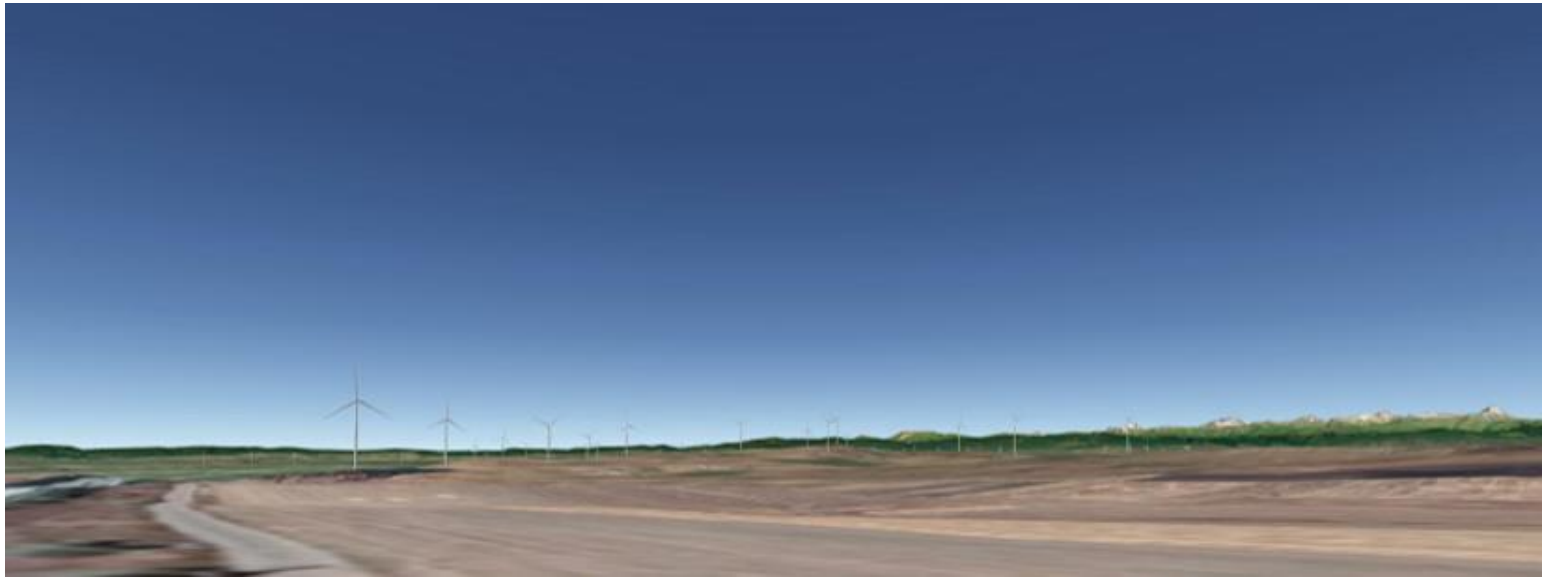
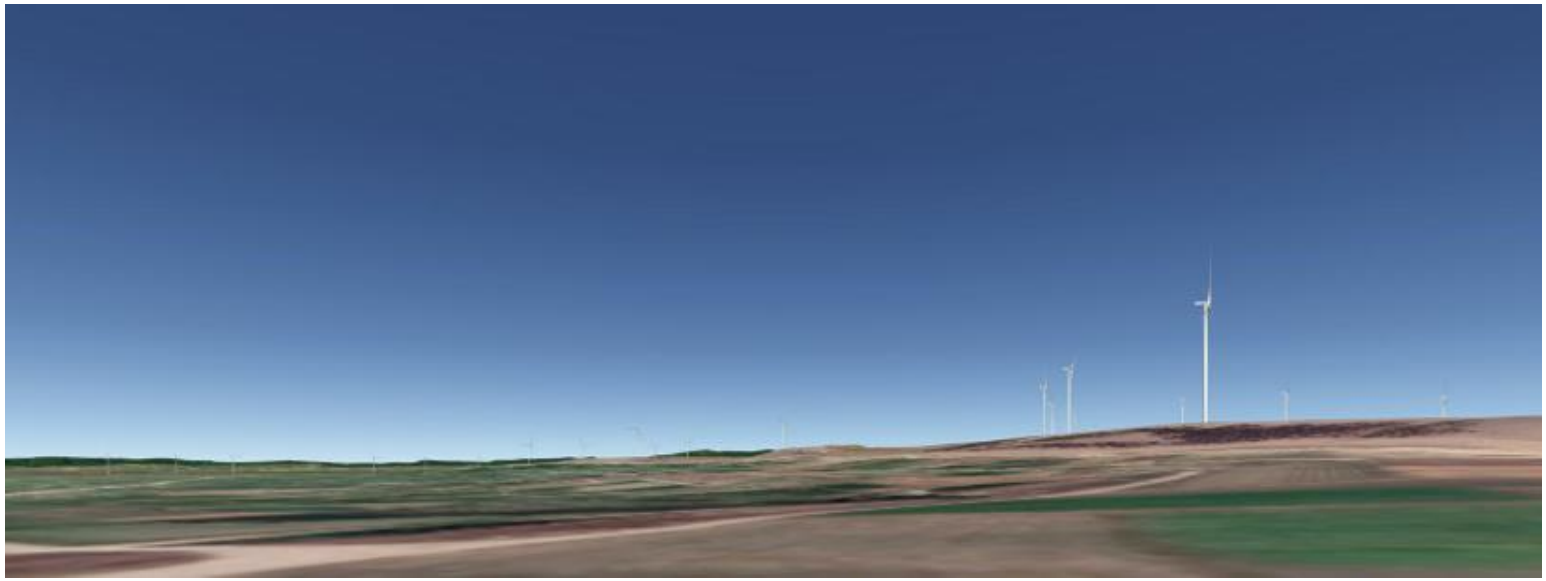


Figure View from Ruisi section of the highway (VP 1 - 01)

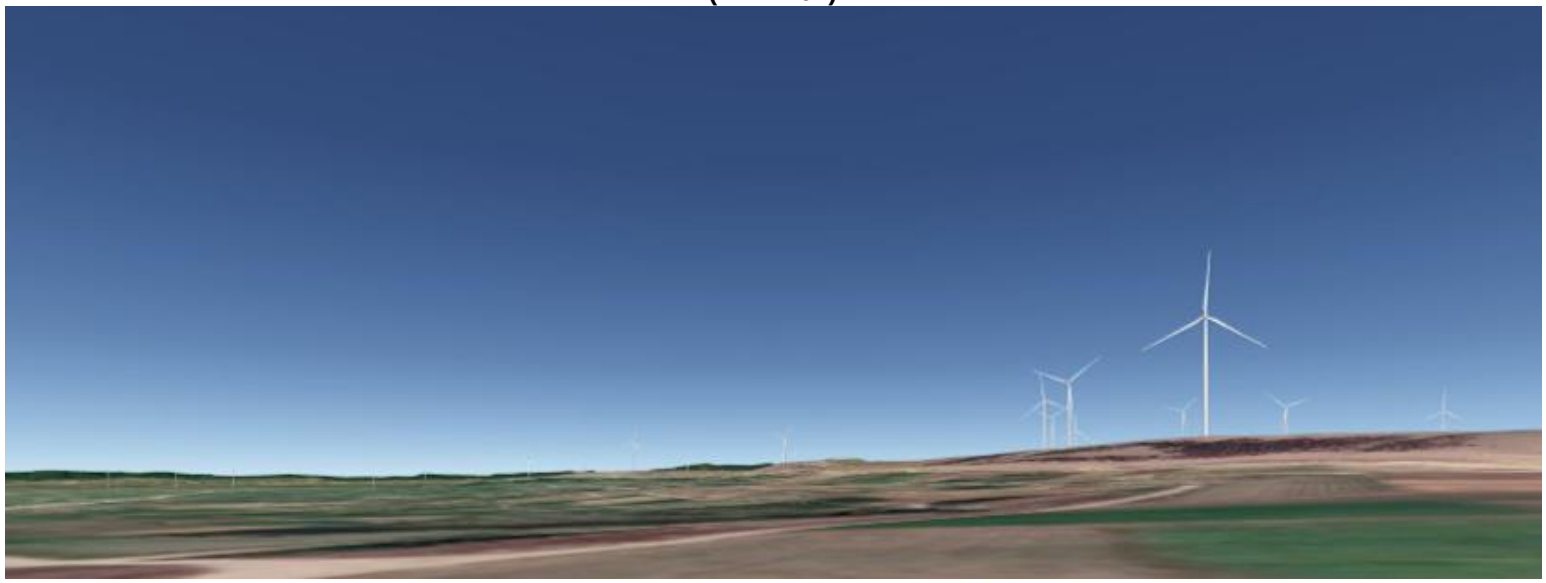


(VP 1 - 02)

(VP 2 - 01)

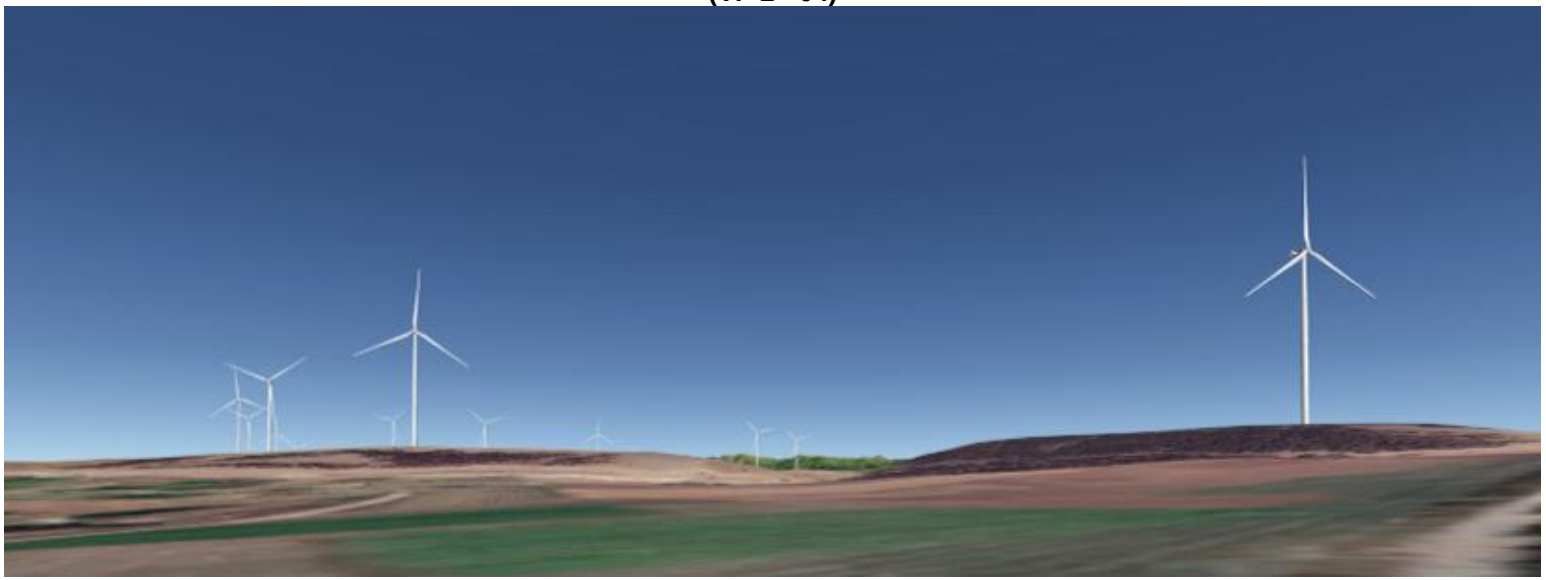


(VP 2 - 02)

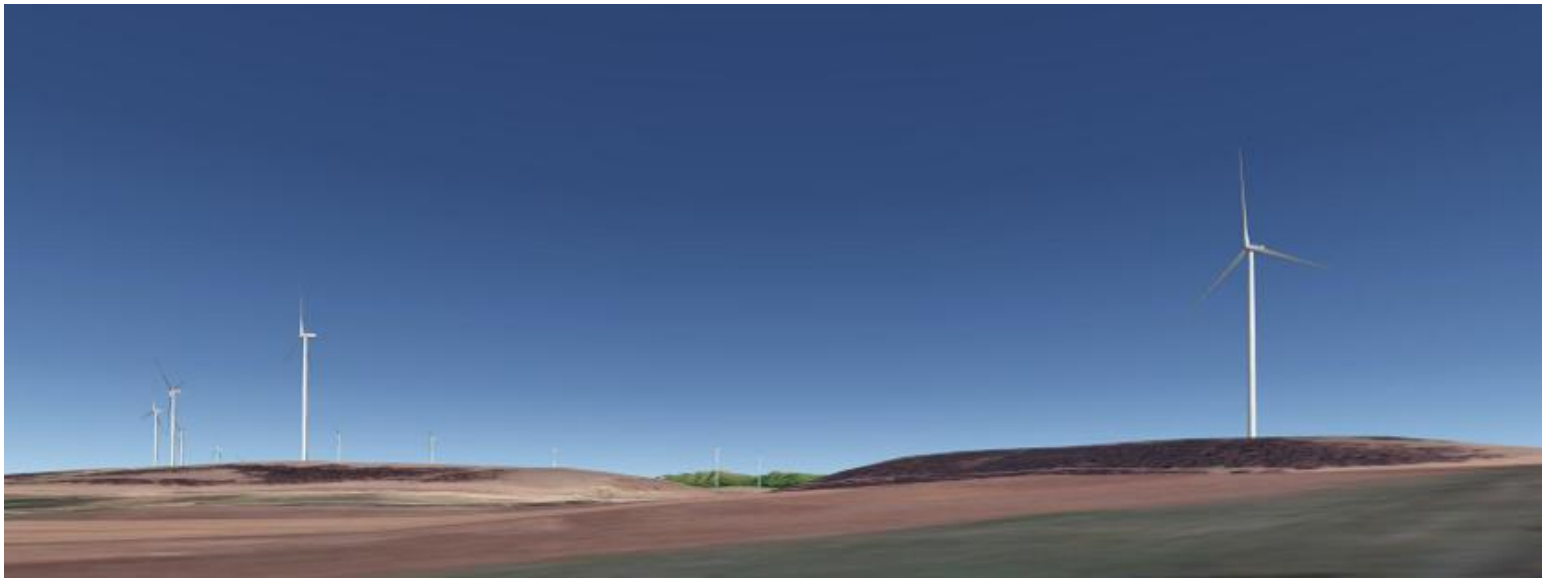


(VP 2 - 03)

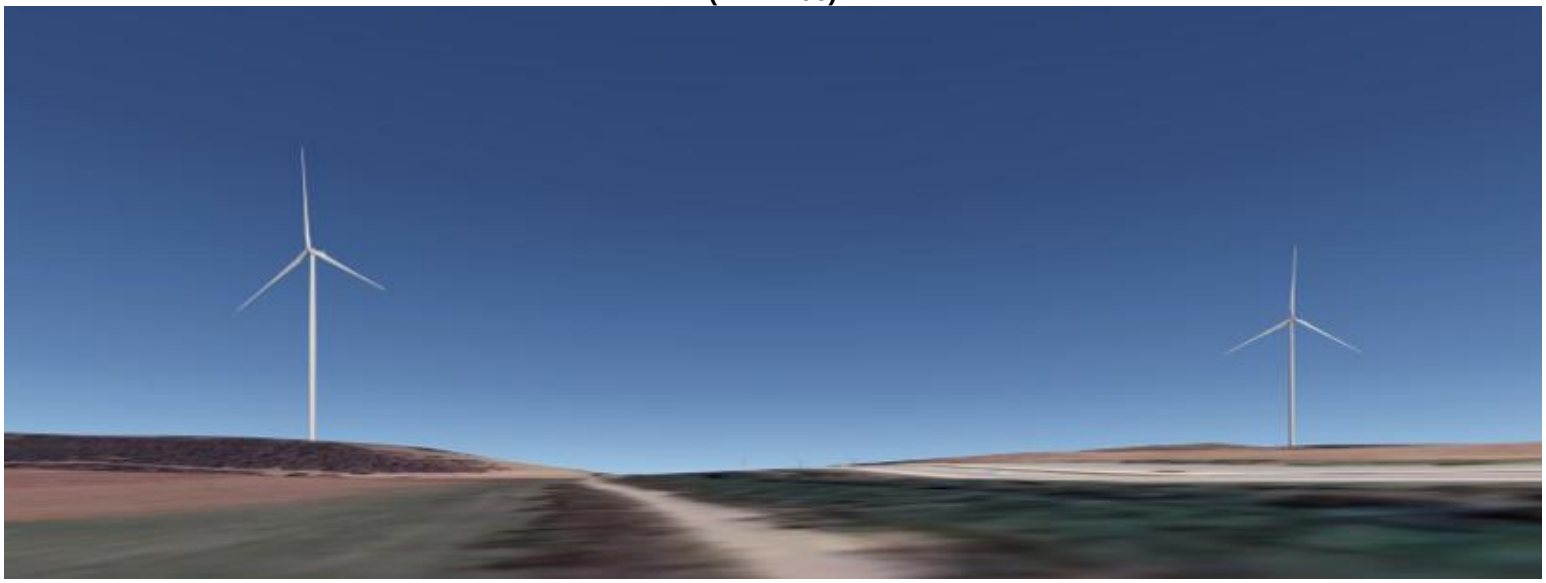
(VP 2 - 04)



(VP 2 - 05)

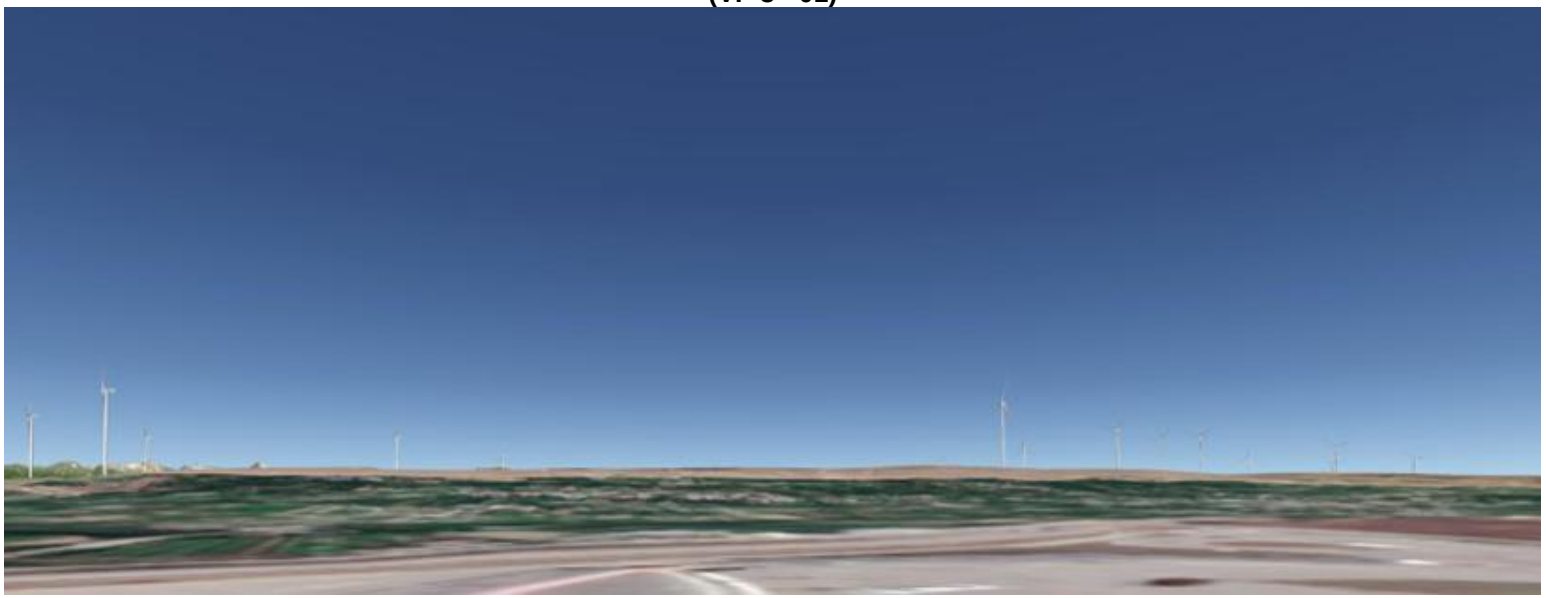


(VP 2 - 06)

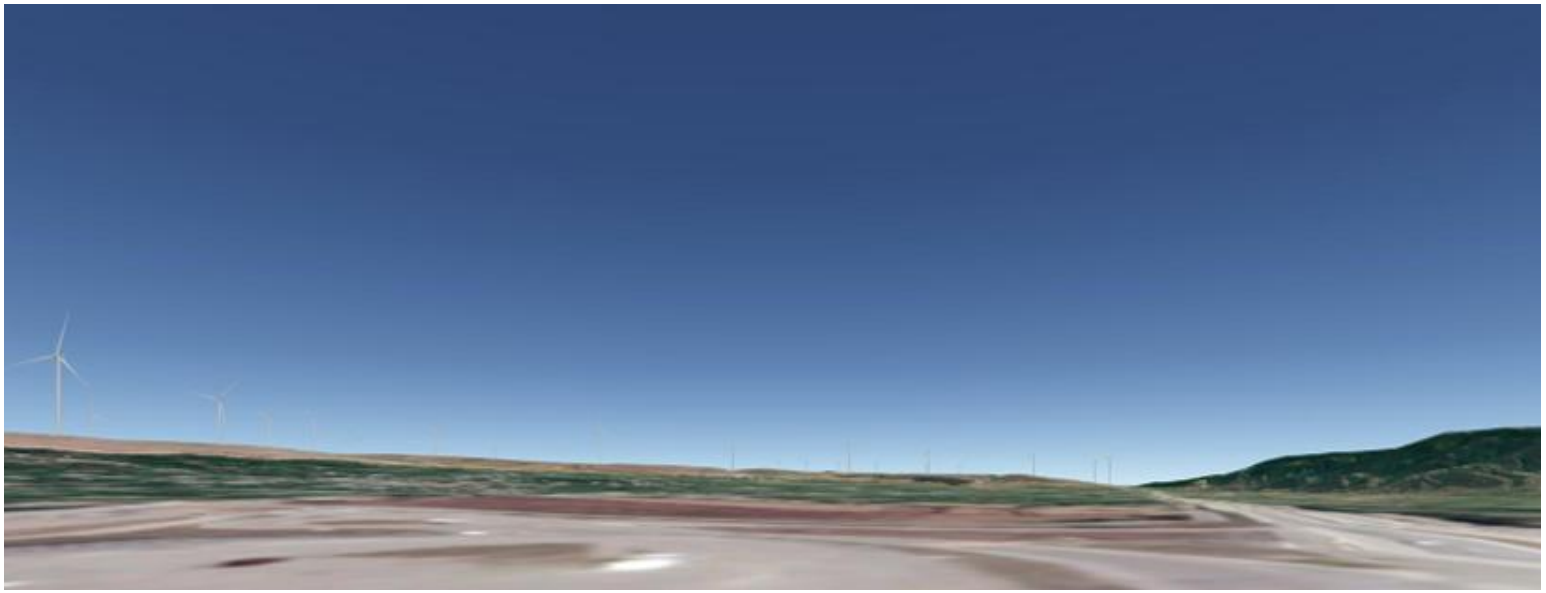


(VP 2 - 07)

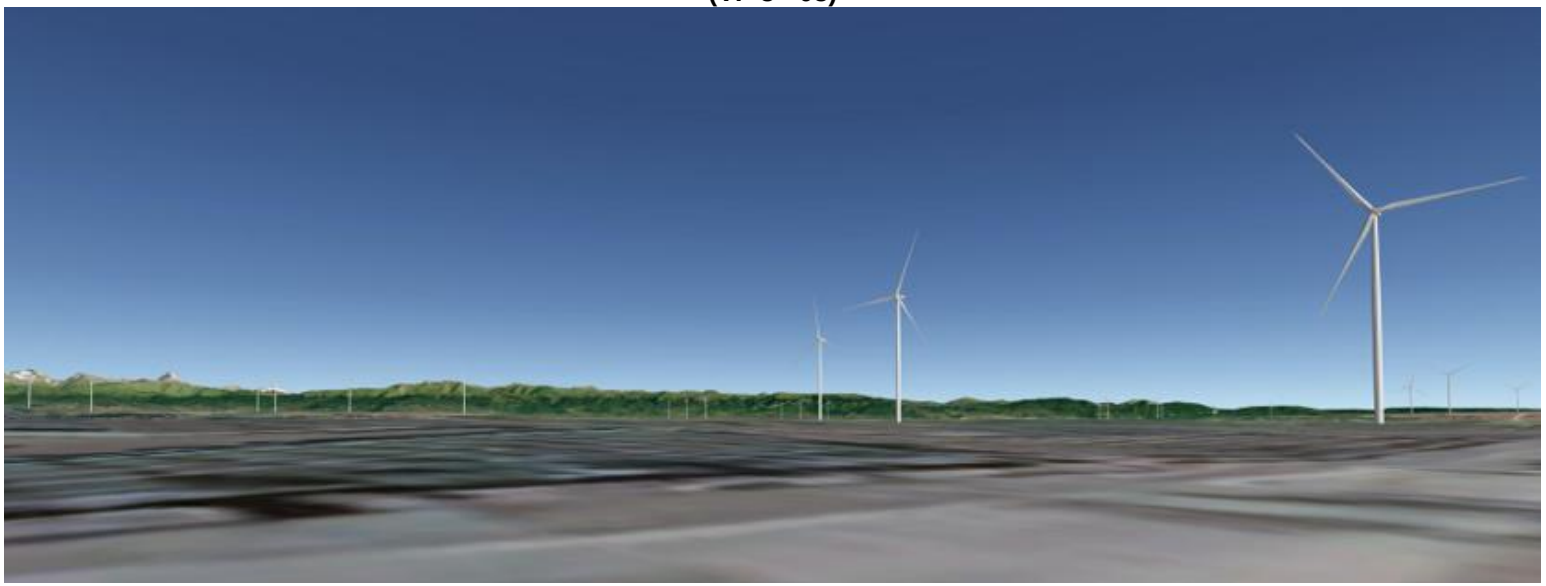
(VP 3 - 01)



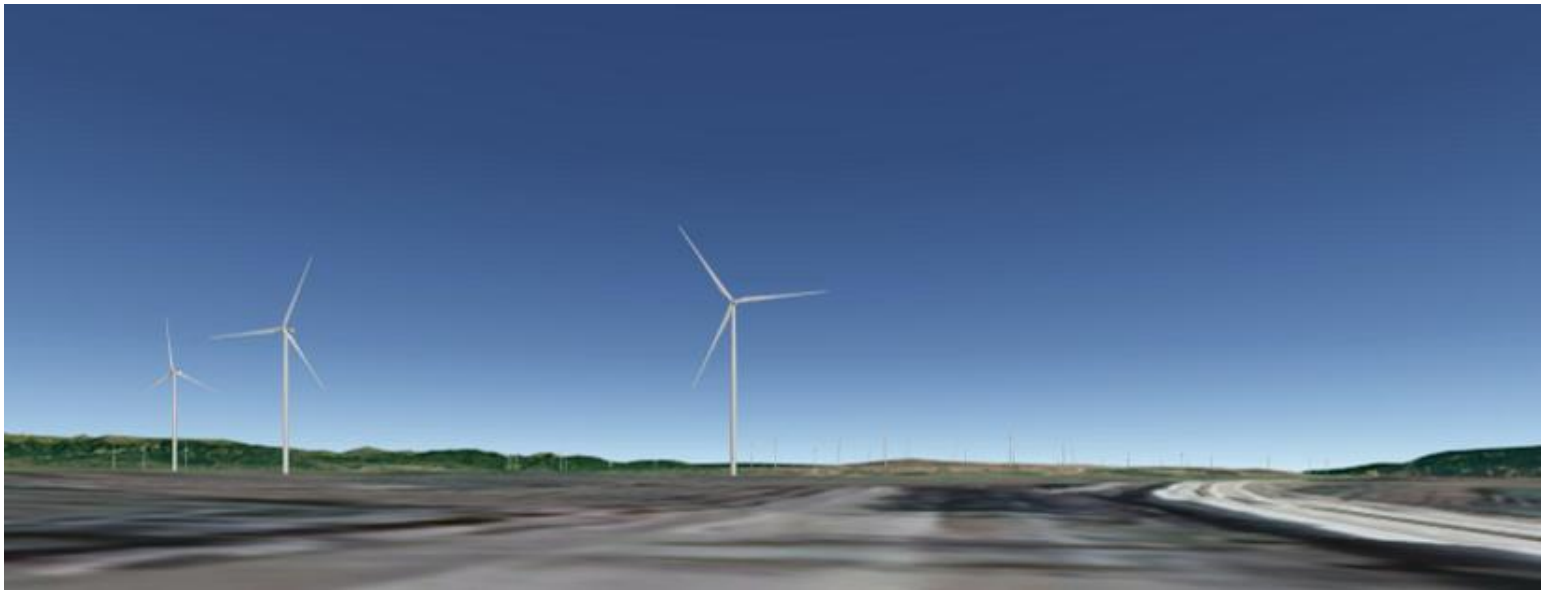
(VP 3 - 02)



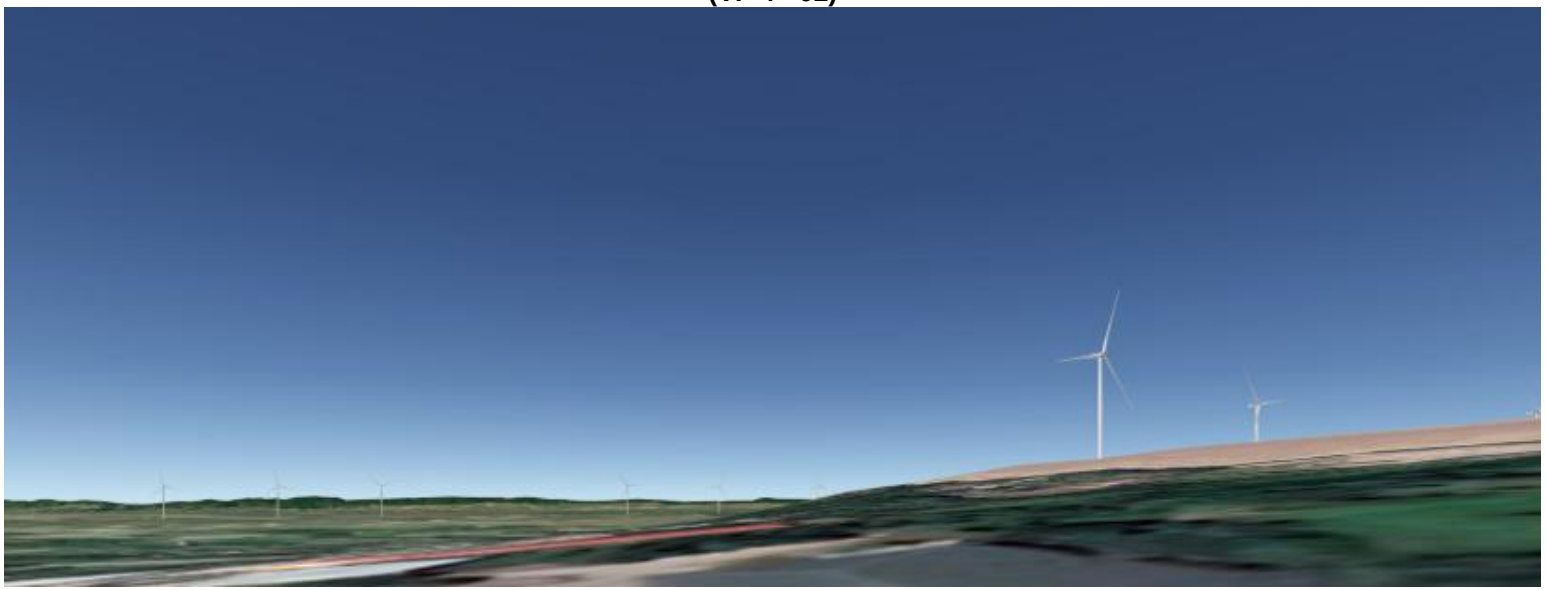
(VP 3 - 03)



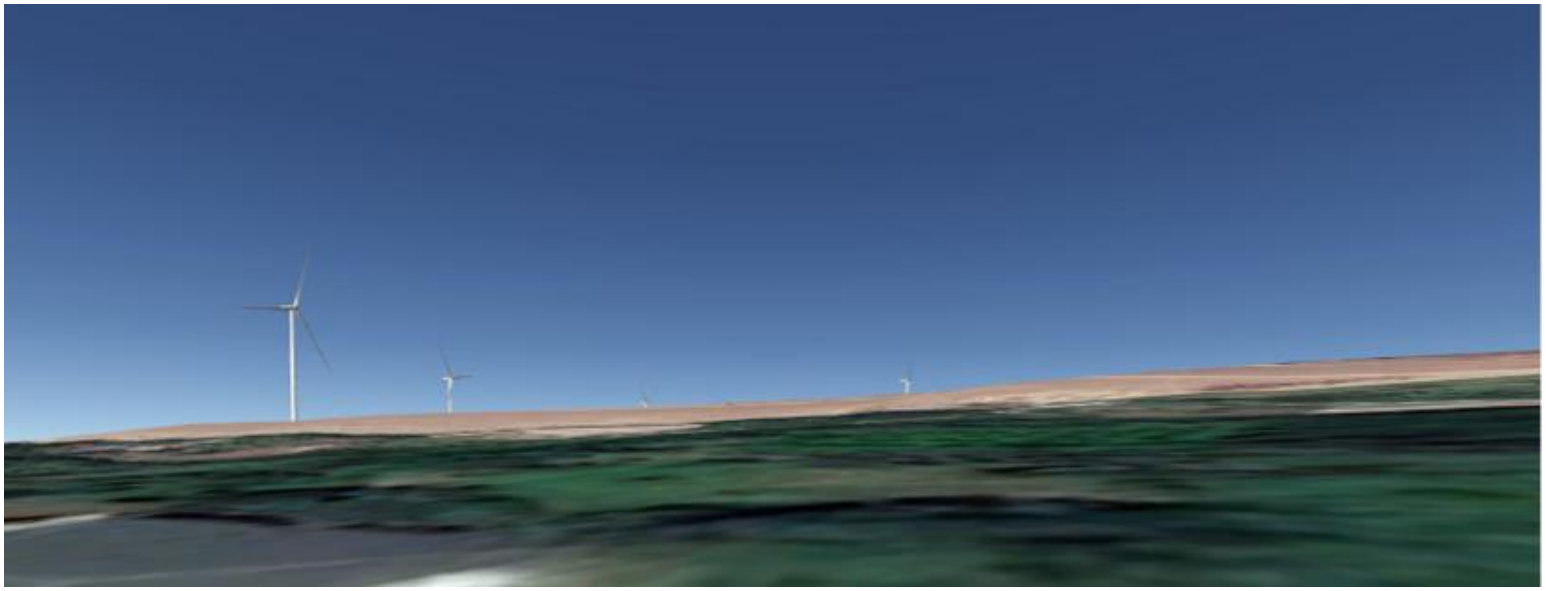
(VP 4 - 01)



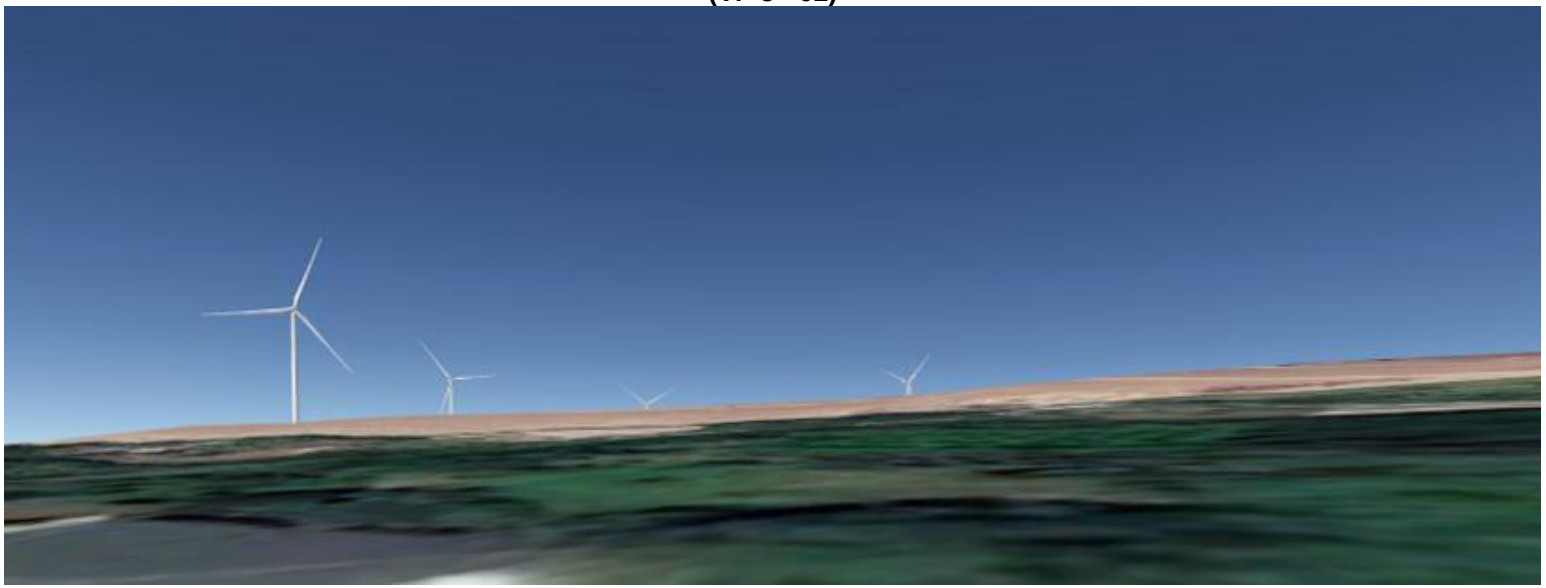
(VP 4 - 02)



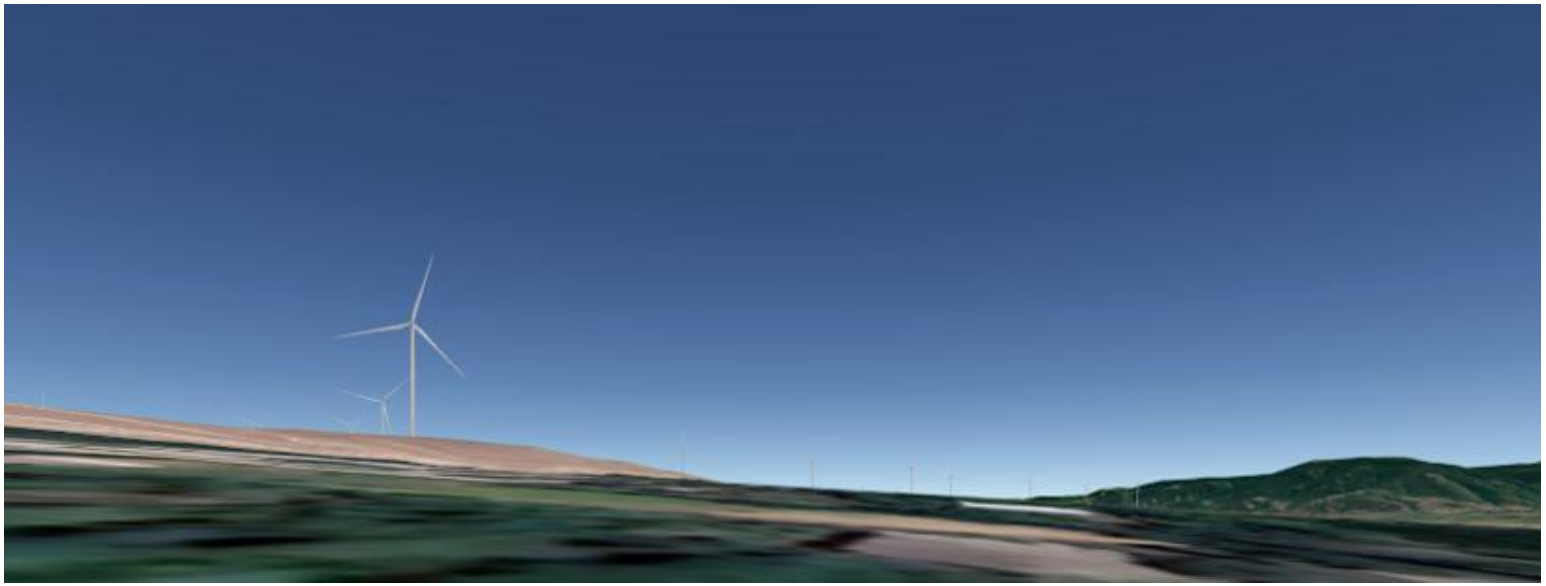
View from Village Ruisi territory (VP 5 - 01)



(VP 5 - 02)

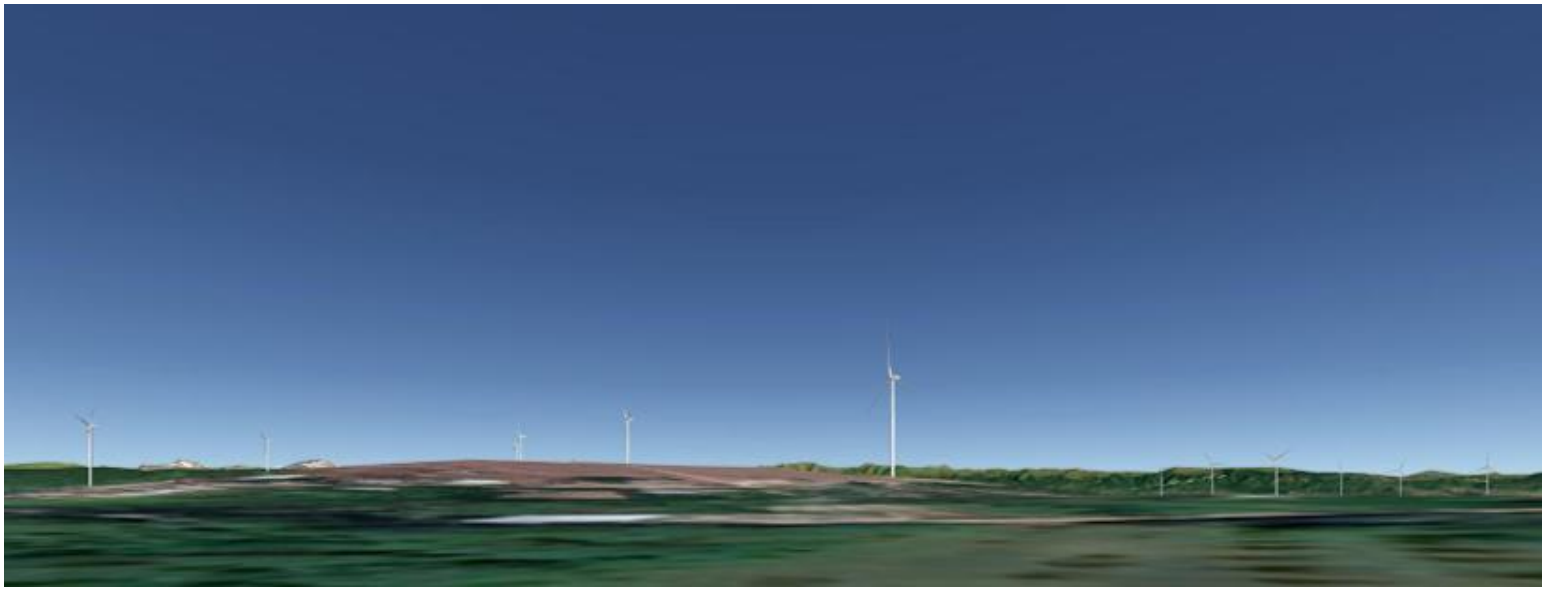


(VP 5 - 03)

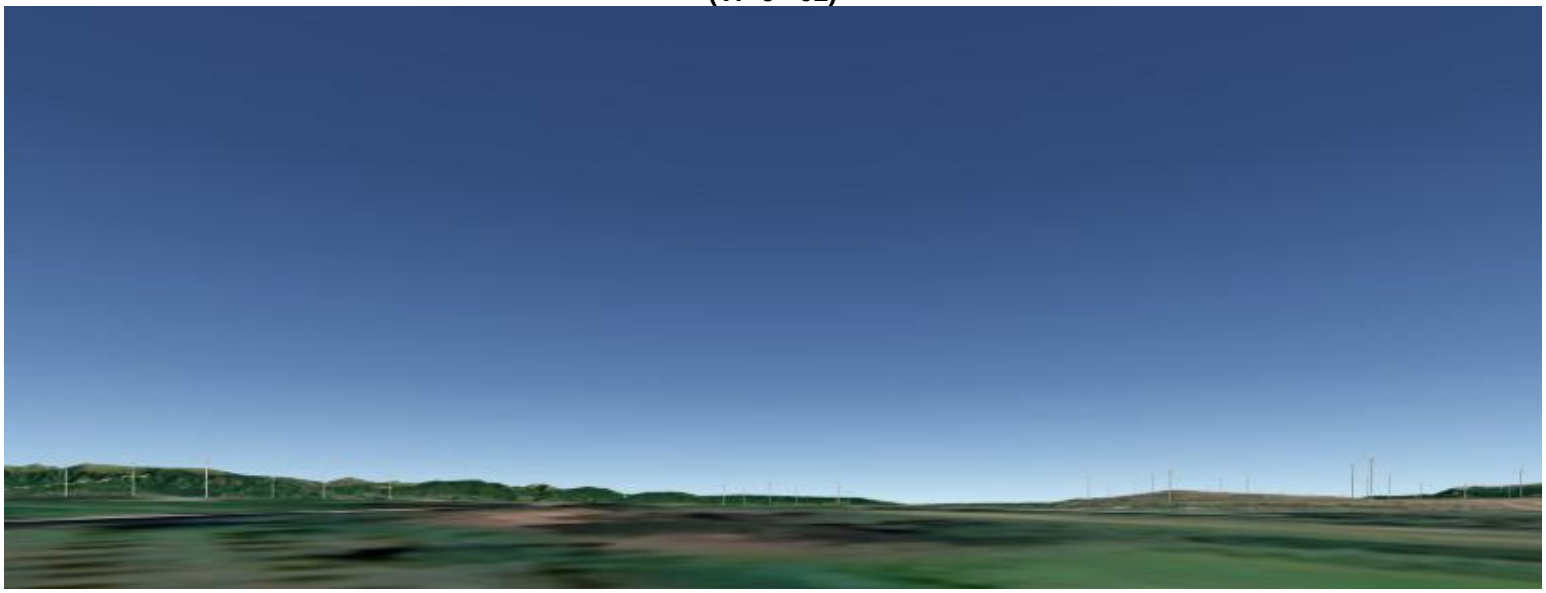


(VP 5 - 04)

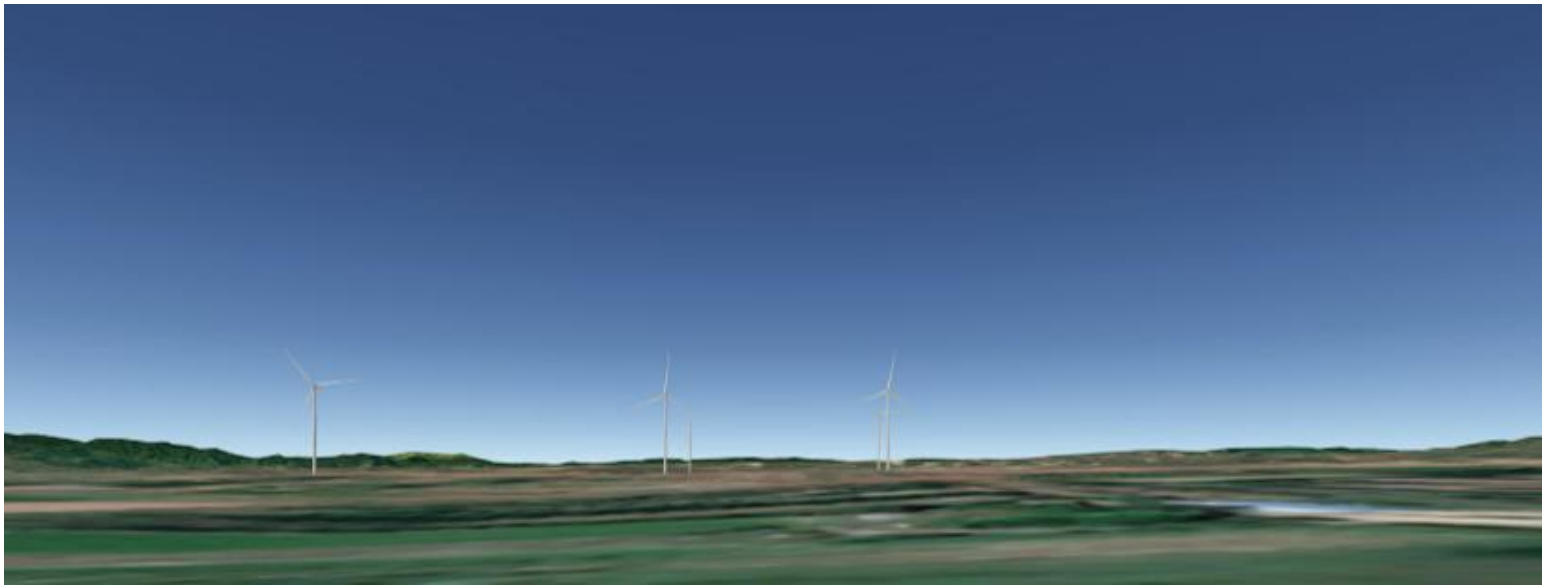
Figure View from territory of village Breti (VP 6 - 01)



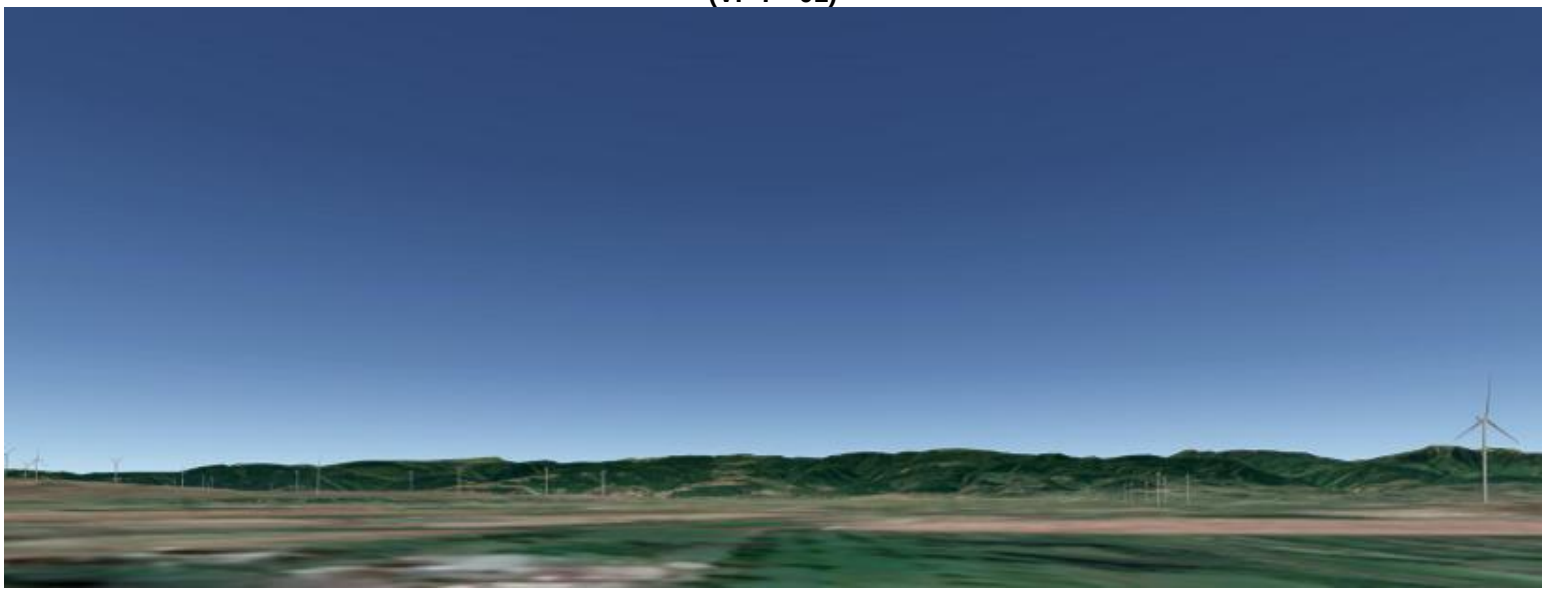
(VP 6 - 02)



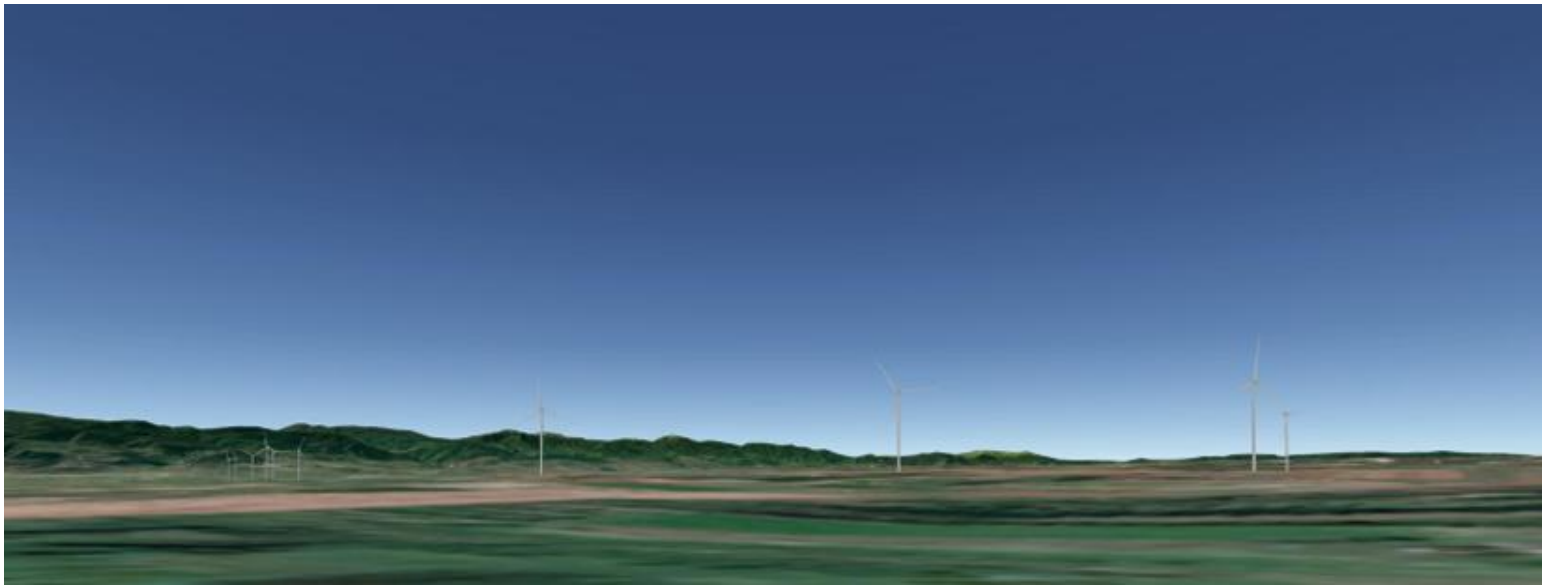
(VP 6 - 03)



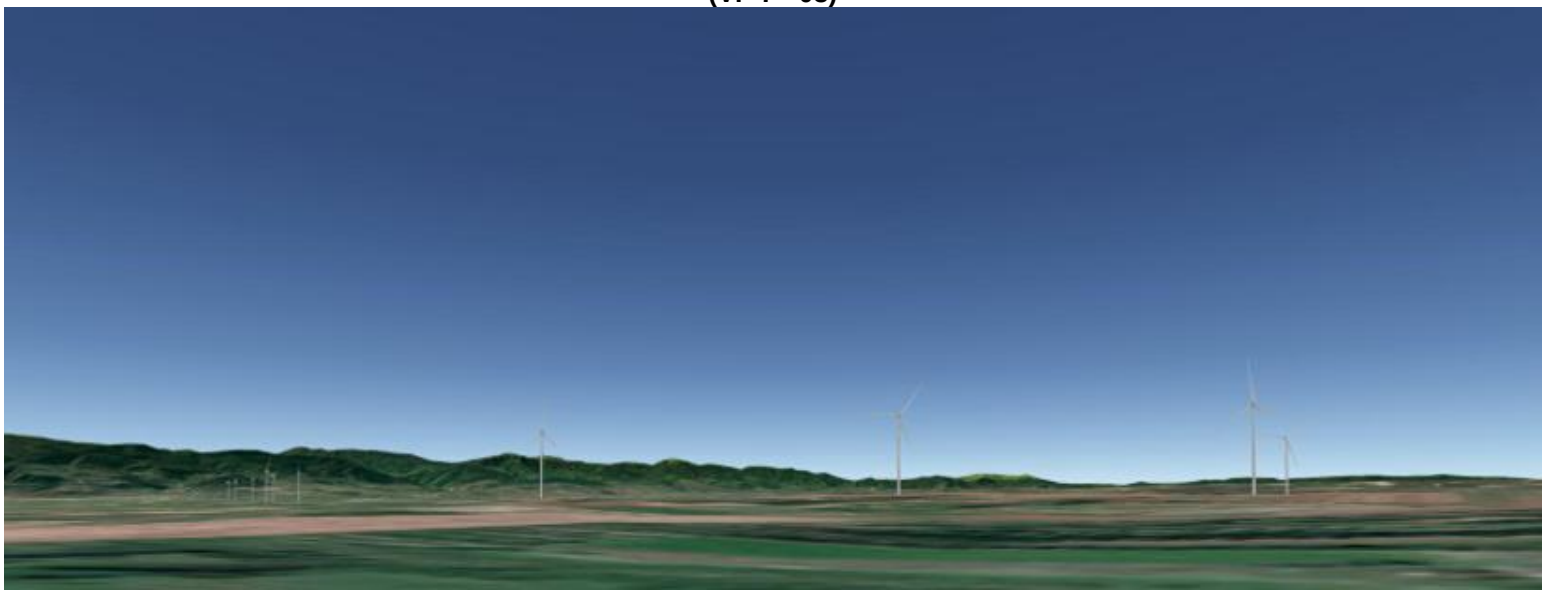
(VP 7 - 01)



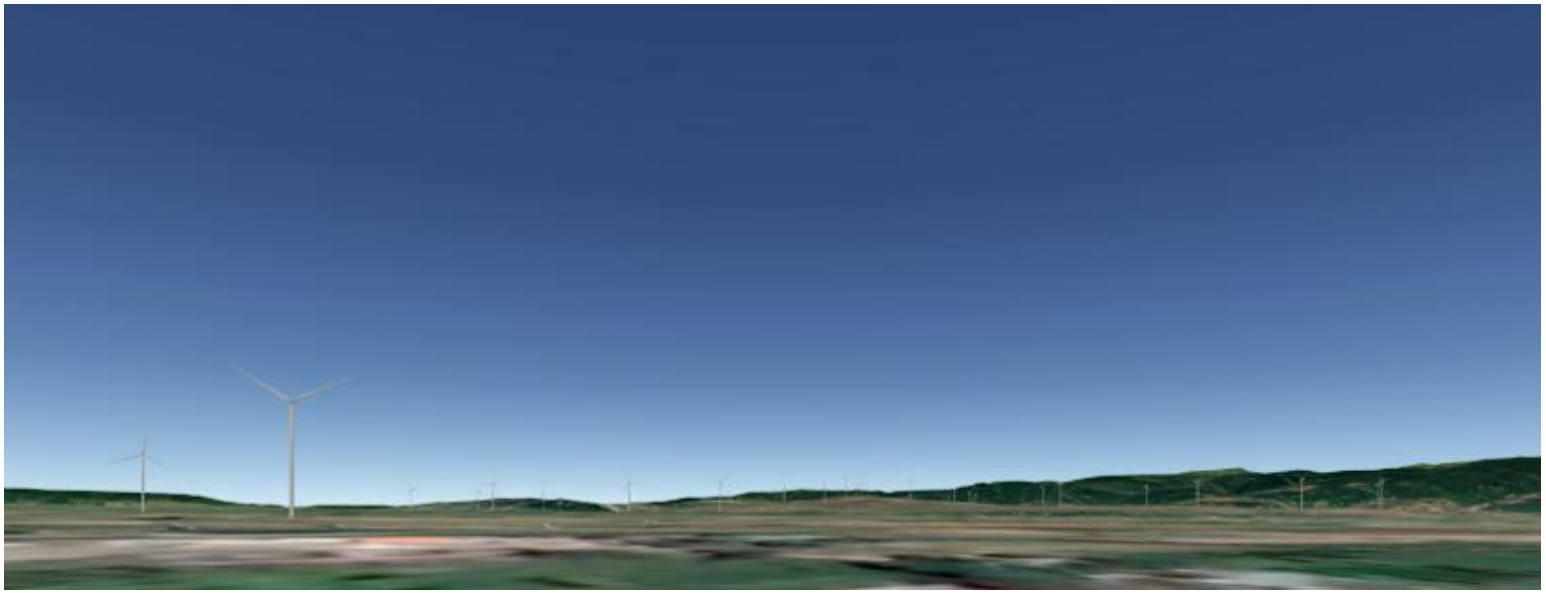
(VP 7 - 02)



(VP 7 - 03)

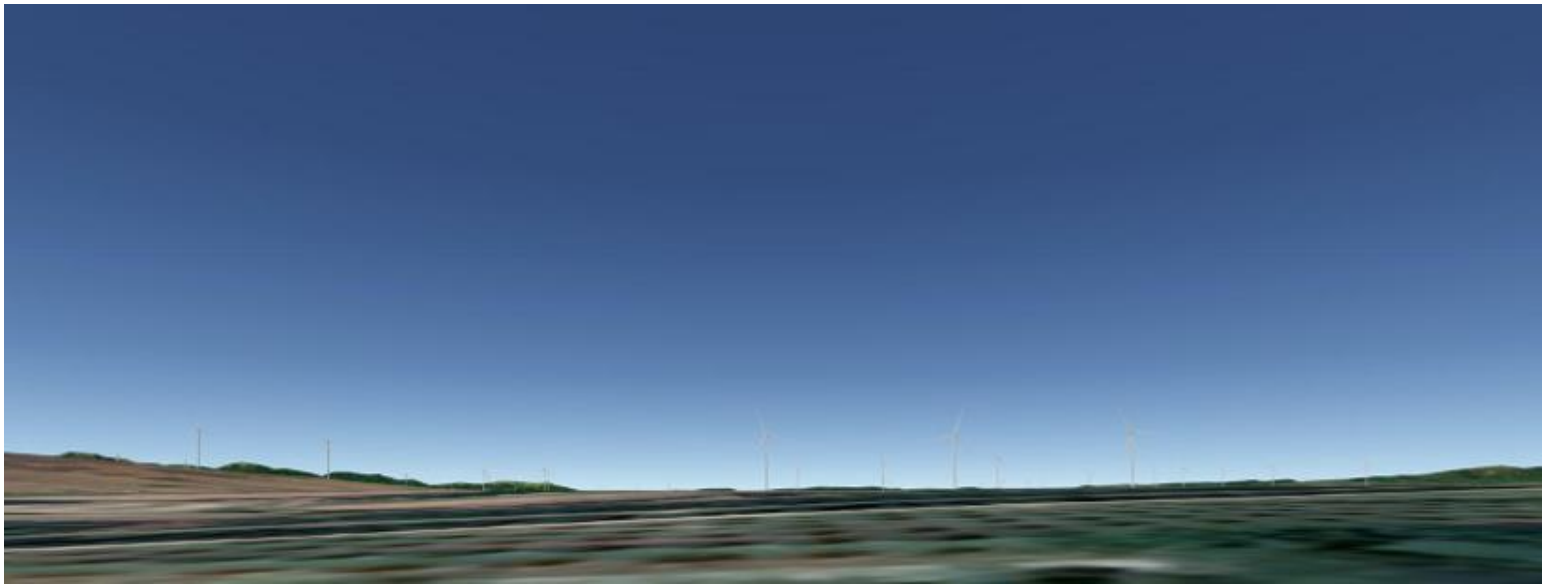


(VP 7 - 04)

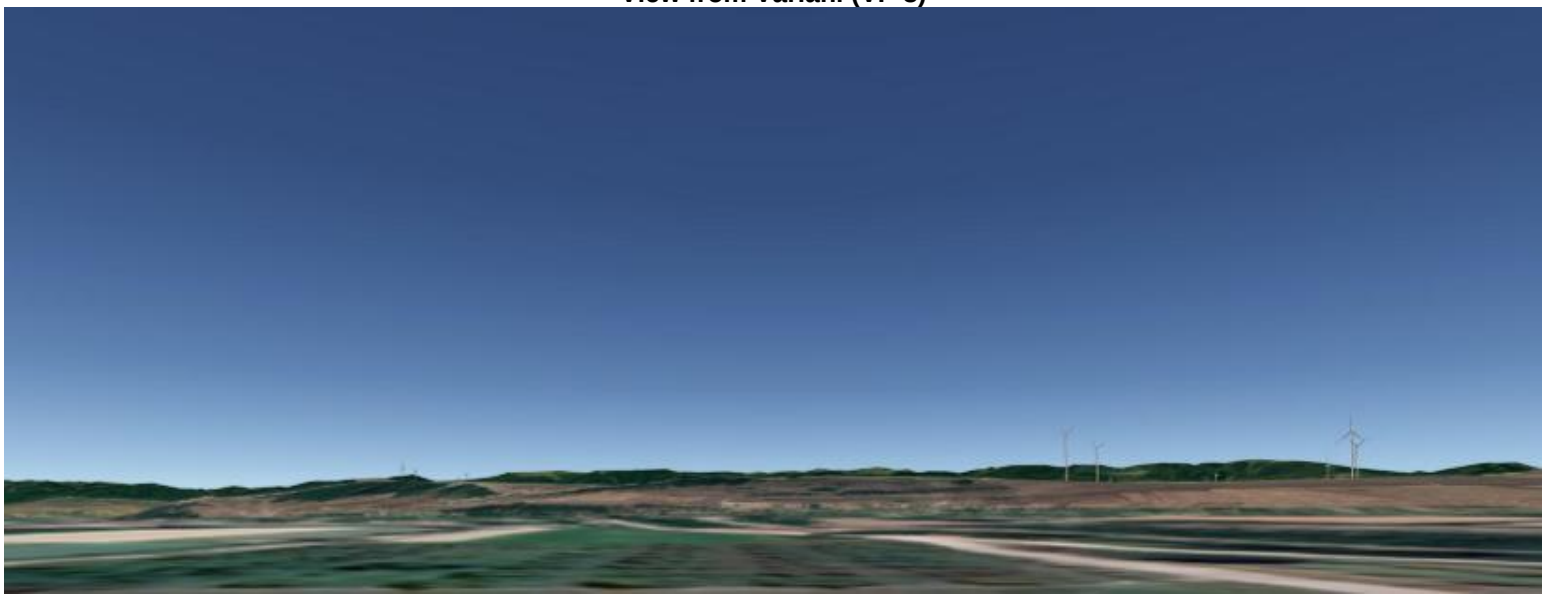


(VP 7 - 05)

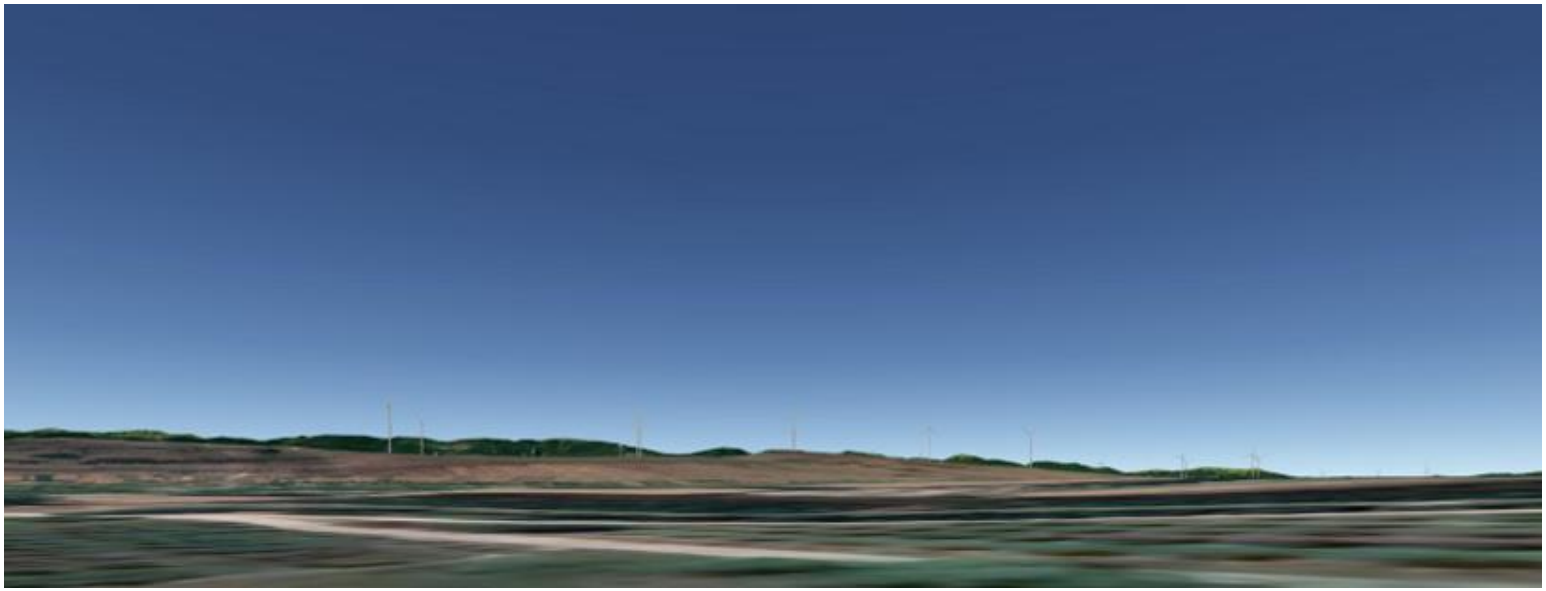
(VP 7 - 06)



View from Variani (VP 8)



(VP 8 - 02)



(VP 8 - 03)

Mitigation measures

Landscape and visual impacts of the construction phase will be mitigated with use of the following measures:

- Less visible sites will be identified to locate temporary structures and store materials and waste;
- Proper sanitary and ecological conditions will be maintained during the construction and operation phases;
- Reinstatement will be implemented after completion of construction works.

Mitigation measures that could reduce operational impact due to presence of wind turbines are not practicable. Residual visual impact is not significant and as practice shows (on Gori WPP section) - does not cause negative reaction of the population and tourists moving on the highway.

Annex 10. Grievance Redress Mechanism

Grievance Strategy

1. Principles

JSC Wind Power seeks to build strong relationships with stakeholders and manage the impact of its business activities on affected communities. Nevertheless, it recognizes that complaints about its activities may occur from time to time.

The Grievance Procedure allows stakeholders to raise questions or concerns with the company and have them addressed promptly and efficiently. JSC Wind Power aims to address all complaints received, regardless of whether they stem from real or perceived issues and whether the complainant is named or anonymous. Any stakeholder who considers themselves affected by JSC Wind Power activities will have access to this Procedure at no cost. JSC Wind Power has primary responsibility for the management and resolution of grievances and will manage this in close consultation with its contractors and subcontractors.

The Grievance Procedure has the objective of helping third parties to avoid resorting to the judicial system for as many grievances as possible. However, Complainants can still resort to Court at any time. The step-by-step process does not deter them from doing so. The Grievance Procedure will be revised and updated periodically based on experience and feedback from stakeholders.

The Grievance Procedure has the following objectives:

- ✓ To establish a prompt, consistent, and efficient mechanism for receiving, investigating, and responding to complaints from community stakeholders;
- ✓ To ensure proper documentation of complaints and any corrective actions are taken; and
- ✓ To contribute to continuous improvement in the Project's social, environmental, and technical performance through the analysis of trends and lessons learned;

The Grievance Procedure addresses grievances that arise from affected communities and any other stakeholder, and a separate mechanism is developed to address worker grievances. Typical complaints for wind power projects include:

- ✓ Complaints related to land acquisition and resettlement;
- ✓ Complaints related to construction damages, and
- ✓ Environmental complaints.

All the issues will be managed and resolved through the same procedure, albeit with specialized assistance from relevant JSC Wind Power Land & Social Team members and independent experts where needed.

This Procedure is open to all stakeholders who consider themselves affected by JSC Wind Power activities. Complaints may be submitted on a named or anonymous basis. Although anonymous submissions may be harder to resolve, they will be treated in the same way as named complaints to the extent reasonably possible.

There are no restrictions on the type of issue a stakeholder can raise under this Procedure. All complaints received under this Procedure shall be tracked until close out regardless of the process under which they are handled. All registered complaints will be responded to appropriately.

2. Procedure

The Grievance Procedure has the objective of helping third parties to avoid resorting to the judicial system for as many grievances as possible. The Grievance Procedure involves the following main steps:

- ✓ receipt and record of complaints;
- ✓ verification;
- ✓ proposition of a resolution.

The above-mentioned steps are elaborated in Annex 1.

JSC Wind Power Land & Social team members will explain how affected community members use the grievance procedure at various public information meetings and face-to-face meetings. A printed version of the Procedure will be displayed and copies will be available at the administrative buildings of the local government.

2.1 Resolution of Grievances

2.1.1 Receipt and record of complaints:

Anyone from the affected communities or any stakeholder can raise a grievance at:

- ✓ The Project Camp areas. The Community Liaison Officers (CLOs) will record it in a Grievance Registration Form (Annex 2) and give back a written copy of the complaint to the complainant;
- ✓ Through the CLOs Land & Social team members working in the affected communities through verbal communication;
- ✓ JSC Wind Power Tbilisi office - Zurab Avalishvili Street No.12.
- ✓ By phone to a dedicated number: 577 77 08 09

Grievances received verbally will be written down by the CLOs and logged into the Project's grievance database. When the information is fully entered, it is printed out and signed by the Complainant to agree that it is a true and accurate record of the grievance lodged. The Complainant is always given a hard copy.

The possibilities and ways to raise a grievance have been explained to the affected communities by JSC Wind Power Social Manager during public meetings organized in the affected communities.

2.1.2 Verification

Once a grievance is raised, JSC Wind Power Land & Social team members will determine whether the complaint has standing, i.e., warrants further consideration as an acceptable complaint. The Land & Social Team will go out to investigate and verify the grievance as soon as possible after the registration process. The data is entered into a Grievance Verification Form. (Annex 3)

The results of the investigation and verification will be shared with the Complainant, either as validation of the grievance or refutation of the original description. A record of this dialogue will be maintained in the Project's Grievances database. All grievances will be acknowledged within 7 days and resolved no later than 30 days.

If the grievance is deemed invalid or ineligible, JSC Wind Power CLOs will record the reason and document that the complainant has been informed of this decision and the basis for this is explained.

After the grievance is verified, JSC Wind Power CLOs will (i) inform the complainant within one week; (ii) define a solution within one week, (iii) meet the complainant to propose an initial resolution; and (iv) agree on and take action to implement a final resolution within 30 days maximum.

2.1.3 Proposition of Resolution

Once a grievance has been verified, JSC Wind Power CLOs will follow the steps indicated below to process the grievance:

- ✓ Identify the parties involved;
- ✓ Clarify issues and concerns raised by the grievance through direct dialogue;
- ✓ Organize a joint site investigation of the complaint involving the contractor, the complainant, and the JSC Wind Power representative;
- ✓ Classify the grievance in terms of seriousness according to the gravity of the allegation, the potential impact on an individual's or a group's welfare and safety, or the public profile of the issue;
- ✓ Assign the grievance to a staff member with appropriate expertise.;
- ✓ Determine the method for resolving the grievance;
- ✓ Gather views of other stakeholders, including those of the Company and if necessary, an agreed neutral technical opinion;
- ✓ Determine initial options that parties have considered and explore various approaches for settlement;
- ✓ Conduct the grievance resolution process as agreed;
- ✓ Mobilize an independent expert if needed;
- ✓ Close the grievances by signing the Grievance Close-Out Form (Annex 4) (i.e. that the grievance has been resolved satisfactorily to both parties).

The resolution of complaints from affected people will be completed within two weeks after the complaint has been received. If further investigation is required, the affected people will be informed accordingly and all necessary arrangements will be taken by the JSC Wind Power.

2.2 Closure of Grievances

A grievance will be considered "closed-resolved" when a resolution satisfactory to both parties has been reached, and after corrective measures have been successfully implemented. When a proposed solution is agreed upon between the Project and the complainant, the time needed to implement this will depend on the nature of the solution. However, the actions to implement this solution will be undertaken within one month after the grievance has been logged. Once the solution is implemented or is implemented to the satisfaction of the complainant, a complaint close-out form shall be signed by both parties, indicating that the complainant agrees with the close-out of the grievance. This form will be archived in the Project Grievance database.

In certain situations, however, a grievance may be "closed-unresolved" when all the above steps have been followed but the complainant is not satisfied with the outcome. In such situations, the Project's efforts to investigate the complaint and to arrive at a conclusion will be well documented and the complainant advised of the situation.

JSC Wind Power will not dismiss grievances based on a cursory review and close them in their grievance record unless the complainant has been notified and had the opportunity to provide supplementary information or evidence.

3. Grievance Records and Documentation

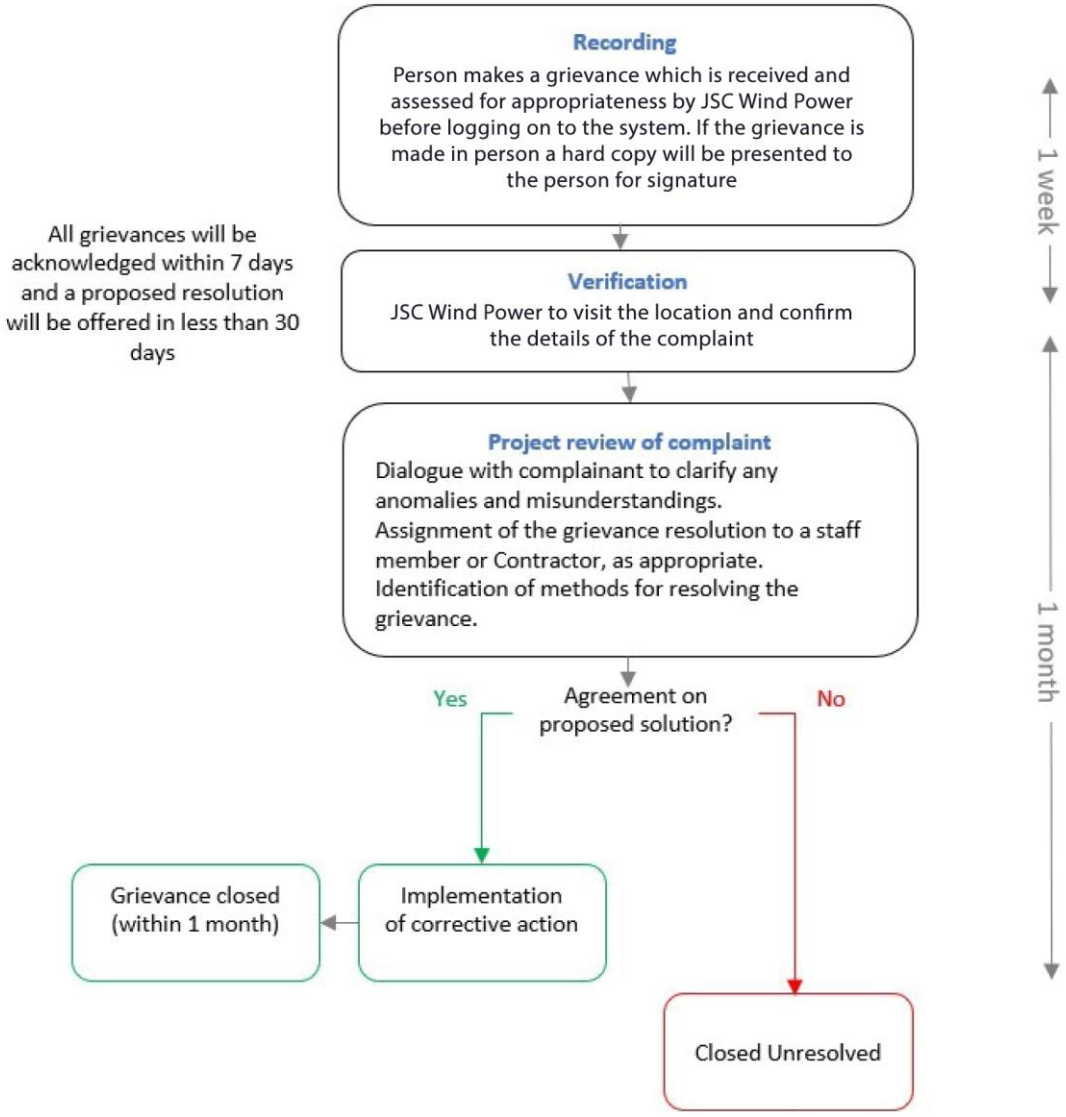
JSC Wind Power will manage a central database to keep a record of all complaints recorded from the Project area. The database will contain the name of the individual or organization lodging a grievance; the date and nature of the complaint; any follow-up actions taken; the solutions and corrective actions implemented by JSC Wind Power, the Contractor, or any other relevant party; the final result; and how and when this decision was communicated to the complainant.

4. Workers Grievance Mechanism

The contractor will set up a workers' grievance mechanism for the construction period as part of its Employment procedure. All workers' grievances are registered and tracked by the contractor's HSE site manager in a workers' grievance database. Workers' grievances are then raised and answered at each Workers' Safety Committee meeting. The contractor HSE site manager then transmits the grievance resolution to the workers and documents their resolution and the workers' acceptance. This workers' grievance mechanism will be monitored by JSC Wind Power every week; detailed information on the number, nature, and resolution of the workers' grievances are included in the Monthly reports of the contractor. The contractor and JSC Wind Power will use the same grievance database, with JSC Wind Power having ultimate sign-off on the closure of all grievances, incl. those handled by the contractor.

JSC Wind Power will undertake regular Employee Rights Audits for all workers including contractor personnel to ensure compliance with national legislations and ILO standards. These audits will be done every quarter during construction. The audit will include the workers' grievance mechanism. This will cover contractor and subcontractor employees. JSC Wind Power will also have a workers' grievance mechanism for its staff.

Appendices


Recording
Person makes a grievance which is received and assessed for appropriateness by JSC Wind Power before logging on to the system. If the grievance is made in person a hard copy will be presented to the person for signature
All grievances will be acknowledged within 7 days and a proposed resolution will be offered in less than 30 days
Verification
JSC Wind Power to visit the location and confirm the details of the complaint
Project review of complaint
Dialogue with complainant to clarify any anomalies and misunderstandings.
Assignment of the grievance resolution to a staff member or Contractor, as appropriate.
Identification of methods for resolving the grievance.
Agreement on proposed solution?
Yes
No
Implementation of corrective action
Grievance closed (within 1 month)
Closed Unresolved
1 week
1 month

Appendix 1 – Grievance procedure

Grievance Registration Form	
საჩივრის რეგისტრაციის ფორმა	
Grievance N ---------- :	
საჩივარი N ---------- -ის აღწერა	
Date:	
თარიღი:	
Project Recorder	
საჩივრის მიმღები:	
Name:	
სახელი:	
Signature:	
ხელმოწერა:	

Appendix 2 – Grievance registration form

Grievance Verification Form	
საჩივრის მოკვლევის ფორმა	
Results of the verification of grievance N ---------- :	
საჩივარი N ---------- -ის მოკვლევის შედეგები:	
Date:	
თარიღი:	
Project Recorder	
საჩივრის მიმღები:	
Name:	
სახელი:	
Signature:	
ხელმოწერა:	

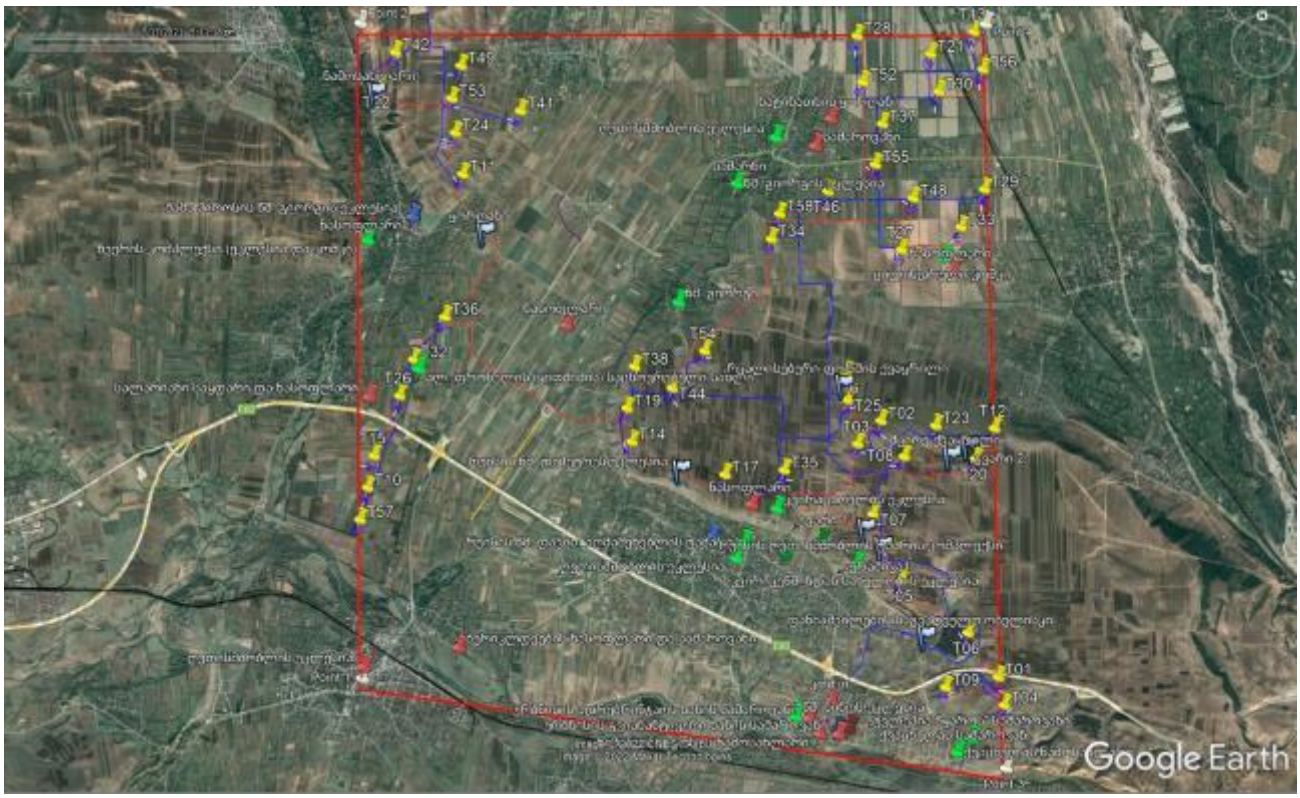
Appendix 3 – Grievance verification form

Close out Form for Grievance			
საჩივრის დახურვის ფორმა			
This is to confirm that the grievance N ---------- has been resolved satisfactory for both parties.			
ეს არის დასტური იმისა, რომ საჩივარზე N ---------- მიღებულ იქნა ორივე მხარისათვის დამაკმაყოფილებელი გადაწყვეტილება.			
Date:			
თარიღი:			
Complainant:		**Project Recorder**	
მომჩივანი:		**საჩივრის მიმღები:**	
Name:		Name:	
სახელი:		სახელი:	
Signature:		Signature:	
ხელმოწერა:		ხელმოწერა:	

Appendix 4 – Grievance close out form

Annex 11. Cultural Heritage Report

Kareli and Gori municipalities
Territories adjacent to Kareli and villages of Dzlevijvari, Dirbi, Tsveri, Breti, Sagholasheni, Bebnisi, Urbnisi, Ruisi, Arashenda, Sasireti, Sakasheti and Variani



Superficial archaeological and cultural heritage study report

Tbilisi
2022

❖ ***Material Cultural Heritage. Study of Background information of Cultural Heritage***

Shida Kartli region - the region in eastern Georgia, includes the central part of the historical-geographical province of Shida Kartli. It is bordered on the north by the Tskhinvali region occupied by the Russian Federation (former South Ossetia Autonomous District).

The municipalities of Mtskheta, Kaspi, Gori, Kareli and Khashuri are a part of historical Shida Kartli, which was called "Zena Sopeli" in the past. Historical Kartli itself was divided into upper, middle or inner and lower Kartli according to its geographical location and the headwaters of the main river.

Shida Kartli extended to the east to Aragvi and Tbilisi, to the north - to the central ridge of the Caucasus, to the west - to the Likhi Mountain Range, and to the south - to the Trialeti Mountain Range and Lake Paravni. The part south of Shida Kartli Mtkvari was called Gaghamamkhari. According to historical sources, the latter was sometimes not included in Shida Kartli, while the country north of Mtkvari was always included in Shida Kartli.

In the XVII-XVIII centuries, the northwestern part of Shida Kartli was called Zemo Kartli. From the first quarter of the 17th century, after the conquest of Samtskhe-Saatabago by the Ottomans, the historical Zemo Kartli was separated from the Kingdom of Kartli for a long time, and the name was transferred to the northwestern part of Shida Kartli. Currently, the northern part of the historical Shida Kartli is included in the Tskhinvali region (former South Ossetia autonomous region) occupied by the Russian Federation and Dusheti municipality.

Area of the territory - 4807 sq/km.

Administrative center - Gori.

Climate – The climate of the country is continental, the average annual temperature is about 11 °C, the possible maximum is 42 °C, and the possible minimum is 32 °C. Wind energy resource (1000 kW/h per 1 km²) - 1000-1500. The average amount of precipitation is 500 mm per year, the maximum is 760 mm, the minimum is 330 mm.

Main water arteries - the following rivers flow in the region: Mtkvari, Didi Liakhvi, Patara Liakhvi, Mejuda, Tana, Ksani, Thortla, Tedzami, Charebula, Lekhura, Suramula, Frone, Dzama and others. Natural healing waters and clean spring waters also flow in Shida Kartli.

In the part of the country controlled by the central government of Georgia, there are 373 settlements, including:

City - 4: Gori, Kaspi, Kareli, Khashuri;
Small town - 2: Surami, Agara;
Village - 366.

To the north and south of Shida Kartli are the high ridges of Caucasus and Trialeti, the branches of which descend towards Mtkvari and form the plateaus. The rivers of Gaghamamkhari - Dzama, Tana, Tedzami and Kavtura form small plains in the lower part, and in the north of Mtkvari there are extensive fields of Doglauri, Tirifoni and Mukhrani, which are served by the rivers: East Frone, Liakhvi, Lekhura, Ksani and Aragvi. Most of the rivers of Shida Kartli have been used for irrigation since ancient times.

From the East Frone River to the Aragva River, along the left bank of the Mtkvari, there is a Kvernak series. There are artificial caves in the brinks and cliffs of its southern slope. To the south of the Kvernak series, on the edge of Mtkvari, is the Ashuriani Plain, which has been used as a winter pasture since ancient times. Based on a certain organization of labor, the vast plains of Shida Kartli and the summer

and winter pastures created the opportunity for the development of intensive farming and cattle breeding. Important trade and transit roads passed here, both from the north to the south (the so-called Aragvi road) and from the east to the west.

In the early and middle feudal times, the territory of Shida Kartli was included in the Saeristavo of Kartli. After the Mongol invasions, it was separated into Ksni Saeristavo (XIII century), and then other large and small units: Aragvi Saeristavo (XIV century), Satsitsiano (XIV century), Saamilakhvro (XV century), Samachablo (XV century), Samukhranbatono (XVI century). From the 16th century, the Kingdom of Kartli was divided into four military-administrative units - flags, three of which were formed in the territory of Shida Kartli. After the union of Georgia with Russia, these vast territories were included in Gori and Dusheti districts of Tbilisi Governorate.

Historical Shida Kartli is distinguished from other regions by its favorable geographical location and good natural conditions. At all stages of Georgia's history, it has always been a pillar of state life. The archaeological monuments discovered and studied in Shida Kartli prove that this area was inhabited in BC. From IV-III millennia. Since then, archaeological and architectural monuments of all periods have been presented continuously.

The researchers consider the excavations of archaeological monuments of the 2nd and 1st millennia BC in the region as a sign of the existence of previous state unions. These are: Mtskheta-Samvarto's extensive mountain settlement and burial ground, Narekvavi settlement and burial ground (Mtskheti district), Khovle settlement, Aghayani settlement and burial ground, multi-layered settlement and burial ground of Grakliani Gori (Kaspi district). This monument deserves special attention, because the B.C. Fragments of an ancient (Aramaic?) inscription are recorded on the base of the altar in the cult building dating back to the 10th century, as well as weighing units found on the same monument.

A number of highly developed areas are beginning to be established as independent political-administrative centers in VII-VI centuries B.C. This is well confirmed by the rich inventory (gold, silver, bronze, iron) found in the tombs excavated in Akhalgori, Kanchaeti, Tsintskaro, Takhtitskaro and other locations of this period. These tombs are considered by researchers to belong to the ancestral aristocracy.

Important strategic, fortification and cultural-religious centers of Kartli are mentioned in ancient Greek, Roman and Georgian historical sources: Mtskheta, Sarkine, Samadlo, Nastagisi, Dzalisi, Aghaiani, Kaspi, Uplistsikhe, Gori, Urbnisi, Dedopli Mindori and others. According to scientists, all of them are of reference value and contain basic data for solving such problems as the origin and formation of the state, relations with the outside world (Mesopotamia, Iran, Greece, Rome, etc.), the formation of the first urban centers in Georgia, the organization and structural division of the state, origination and functioning of religious and cult centers, etc.

In the IV-III centuries B.C., a powerful state union Iberia was created in Shida Kartli, the center and capital of which was Mtskheta to the beginning of the 6th century A.D. Trade routes of world importance passed through Mtskheta, including so called the Silk Road. The cities of Mtskheta, Kaspi, Aghaiani, Uplistsikhe, Gori, Urbnisi and others were located on this road or in its immediate vicinity, as well as strategic and cultural-religious centers Grakliani, Tsikhia Gora, Dedoplis Gora and Dedoplis Mindori temple complex. Based on the study of various artifacts and written sources obtained as a result of archaeological excavations, it has been established that these points were developed city centers of the Hellenistic-Late Ancient period (3rd-1st centuries B.C. and 1st-3rd centuries A.D.) and had intensive trade with the Greco-Roman world, Seleucid Syria, Armenia, Parthia, Sasanian Iran, etc. They are reference monuments for the dating of the archaeological cultures of the Caucasus, for the study of urban processes and the history of the development of society. Some of the monuments - Mtskheta, Nastagisi, Urbnisi, Aghaiani clearly show the emergence of the first Christian communities and the ethnic situation (for example, the first appearance of Jews in Kartli) that accompanied the emergence

of ancient cities. The ruins of different types of defense and city buildings, palaces, temples, baths, mausoleum-type rock dams, etc., are especially noteworthy. In addition to the numerous monuments of the above-mentioned period, the discussed region also presents churches-monasteries of all periods of the Middle Ages, ruined villages and cities, burial grouns, ruins of feudal castles, etc.

There are many important monuments of architecture and culture in the municipality. Hundreds of monuments and objects of cultural heritage have been specified and registered, which, of course, represent only a small part of the material and cultural values of this region.8.

Kareli Municipality - a municipality in Georgia, located in Shida Kartli region. The administrative center is the city of Kareli.

Kareli municipality borders Gori municipality to the east, Khashuri municipality to the west, Borjomi municipality to the southwest, Java municipality to the north, and Sachkhere municipality to the northwest. Tsalka municipality is a few kilometers away. The area of Kareli Municipality is 687.9 km².

It was created in 1939. In 1963-1964, it was united with Khashuri and Gori districts. After the abolition of the South Ossetia Autonomous District in 1991, the territory of the former Znauri district belonged to the Kareli district. Since 2006, the municipality of Kareli has existed within the borders created in 1965.

City - 1: Kareli.

Town - 1: Agara (Kvenatkotsa).

Community - 16.

Village - 70.

Archaeological monuments discovered in the territory of Kareli municipality are one of the most important in Georgia and the Caucasus from the topography and scientific point of view. First-class monuments such as Dedoplis Gora, Dvani settlement and burial ground, Takhtidziri and Doglauri burial grounds, etc. are gathered here. It is especially worth noting a unique, ancient oriental type grand temple complex of II-I centuries B.C. found on the Dedoplis Mindori. As a unique archeological-architectural monument, it has been assigned the category of national importance. There are eight temples, two temple-gates and other temple buildings around the square courtyard. Archeological works revealed that the buildings were built with adobe bricks on a cobblestone base. Adobe walls of the main temple are preserved at a height of two meters, their inner side is plastered and painted red, the buildings were covered with red-painted tiles; the roof was based on wooden columns, which were decorated with capitals carved from limestone, decorated with carved ornaments. Excavator and researcher of the monument I. Gagoshidze notes that the complex is a completely unique archaeological monument, the likes of which have not been found not only in Georgia, but in the entire Transcaucasia. The area of the complex is more than five hectares, based on the data of aerial photography, Mr. Gagoshidze believes that an urban-type settlement was probably spread over the 80-hectare area to the east of the temples.

In the village of Doglauri, there is a multi-layered historical monument dating back to the 4th century B.C. and 2nd centurie A.D., called Aradeti Orgora, also known as Dedoplis Gora (Queen's Hill), where the ancient, early iron, late bronze and early bronze age layers are intersected. As a result of excavations, the ruins of the king's palace from the 2nd century B.C. and 1st century A.D. have been found. The palace was probably two or three stories tall and had towers placed in the corners. Traces

[8] Data on the cultural heritage of the region have been published in a number of periodicals and scientific papers, which, of course, we will refrain from listing in full here.

of halls, columns and altar are clearly visible. Iron skewers, bronze scales, details of a pitcher, grains of wheat, various ceramic vessels, gold, bronze and silver jewelry and coins, a borjghali (rotating swastika) and a star carved in stone, a loom, flax, cotton and silk fabric fibers were found. The palace was probably destroyed by a strong earthquake.

Important monuments of cultural heritage are located in Kareli municipality: Mdzovreti castle-hall complex; Samtsevrisi Church; Kintsvisi complex; the historic villages of Ruisi and Urbnisi, with their most important temples and burial grounds; Churches of Dirby (Dirby Church Complex of Our Lady, Church of St. George of the Zedajvari of Dirby, Church of St. George of Dirby, Church of All Saints of Dirby, Church of St. Theodore of Dirby). Ruided village Abukhalo is located on the territory of the municipality, where the ruins of the hall-type church have been preserved. The monument consists of eight interconnected caves of different sizes carved into the rock; In the village of Sagholasheni, there is the Church of the Assumption of the Virgin Mary of Sagholasheni, which dates back to the developed feudal age and was rebuilt in the 19th century; In the village of Zghuderi, there are the Church of Zghuderi, the Church of the Mother of God of Zghuderi, and the Church of St. Stephen of Zghuderi; village Atotsi's Castle is located in Atotsi; Dzadzvi complex is located in Imerkhevi. It dates back to earlier feudal times.

Kareli - a city in Georgia, in Shida Kartli area, the administrative center of Kareli municipality. It is located on the plain of Shida Kartli, on the river Mtkvari. The height is 620 meters above sea level, the distance from Tbilisi is 94 kilometers. Kareli became the district center in 1939, transformed into a town in 1962, declared a city in 1981. There is a railway station, industrial enterprises, healthcare, educational and cultural institutions in Kareli.

According to the 2014 census, 6,654 people live in the city.

Kareli, as well as a large part of settlements on the other side of river Mtkvari was included in Satsitsiano. It was first mentioned in the 17th century. According to the ruling on the divorce of the Tsitsishvili children, which was conditionally issued in 1664-1673, Tsitsi and Kaikhosro inherited Paata Gongliashvili who lived in Kareli with his estate. Kareli was originally a small village, and since then it has grown and developed, as the Tsitsishvili family abandoned Mdzovreti (2nd half of the 18th century) and moved here due to the incessant raiding of the Leks. This is confirmed by comparison of 1715 and 1804 population census materials. A total of 20 families lived in Kareli in 1715, and by 1804 the population reached 215 families - among them 169 Georgians, 12 Ossetians and 34 Armenians.

In 1778 Batonishvili Giorgi (later Giorgi XII) traveled to Trialeti and during this trip he passed through Satsitsiano, including Kareli. Platon Yoseliani informs us that the king's son "descended Mt. Satsitsiano from Taparavni and came to Kareli, from there Mroveli the Bishop Ruisi invited him, passed through Mtkvari on a raft, and spent three days with him."

Later, the intensive growth of Kareli was facilitated by the construction of the railway here and its transformation into the administrative center of the district. In 1921-1930 It was the center of the Kareli region of Gori district.

The following monuments/objects of cultural heritage are located in the vicinity of Kareli:

Church of Our Lady of Kareli - a church in the city of Kareli, municipality of Kareli. It is located in the northern part of the city. According to the construction inscription, it was built in 1850 by the order of Fanaskertel-Tsitsishvili, son of Eustatis. During the repair, it was covered with tiles (on wooden structures).

The church has a hall (15.7X9 m), built of cobble stone and brick. It has two entrances, south and west. Both entrances are rectangular inside and outside, covered with an architrave. On the axis of the deep

semicircular apse is an arched window with wide arched niches on both sides. Inside and below the northern niche is another small niche. The sanctuary is elevated by two steps. There are two wide arched windows in the south and north walls. In the north-west corner of the church, in the thickness of the wall, there is a rectangular room with an arched entrance at a height of 2 meters from the outside. The storeroom was connected to the church hall through an opening (sealed). On the longitudinal walls of the hall there is a pair of two-tiered pilasters. The first level of pilasters is supported by decorative arches of the wall, the second level is supported by vaulted arches with shelf capitals at the heels.

There are three semicircular niches on the eastern facade of the church. Indented crosses are depicted between the niches. On the south facade, on both sides of the entrance, there is a pair of pilasters. On the right, between the pilasters, there is a window, and below it is a niche (sealed). On the left side of the entrance, between the pilasters, there is an indented cross above, and below is the entrance (sealed). A construction inscription is carved on the stone of the architrave of the southern entrance of the church.

Kareli Barrow Plain - an archaeological monument west of the city of Kareli, on the right bank of the Dzama River. dates back to XIII-XII centuries B.C. It was excavated in 1972. The height of the stony mound is 0.6 meters, the burial pit is rectangular. 13 vessels of black and dark gray clay were found in the barrow.

Dzlevijvari - a village in Georgia, in Kareli municipality of Shida Kartli district. It is located on the Shida Kartli plain, on the left side of the Eastern Prone river. 730 meters above sea level, 9 kilometers from Kareli.

According to the 2014 census, 788 people live in the village.

Dirbi - a village in Georgia, in Kareli municipality of Shida Kartli district (community center). It is located on the Shida Kartli plain, on the right bank of the East Prone River. 735 meters above sea level, 16 kilometers from Kareli.

It was first mentioned in historical sources in the 18th century. According to Vakhushti Bagrationi, Dirbi Monastery was the residence of the Archimandrite of the Jerusalem Cross Monastery (chosen by the kings of Kartli). Dirby is mentioned in 1715 in Ruisi congregation register, in the census of 1794–1799 by Ioane Bagrationi.

In 1650, King Rostom renewed the book of inviolability to the Dirbi monastery, exempted it from royal taxes (except for the duty of conscription and hunting) and left the tax of the Jerusalem Cross Monastery - 6000 tetri to be sent "in silver to Jerusalem". The country of Dirby was included in the congregation of Mroveli (Bishopric of Ruisi), and the ruler of the estates was Jvaris Mama Nikozeli (Bishop of Nikozi). In 1785, by the order of King Erekle II, Dirbi's inviolability was renewed again. When he divided Kartli into royal districts and provinces to fight against the Leks, he assigned the fourth place to the village of Dirbi, which shows the great strategic importance of the fortress there.

In 1745, the army of Leks surrounded the castle of Dirbi, which was fortified by Ioane Sarkeulidze. Teimuraz II and Erekle II came to Dirbi assistance with a combined army. The Georgian army won and liberated Dirbi. Dirby Castle saved the population from capture and pillaging in 1753 during the battle with the Leks. On August 6, 1902 and in the spring of 1903, agrarian-revolutionary demonstrations took place in Dirbi. The landlords demanded that the peasants paid land rent in cash for the lack of crops. This caused discontent among the peasants. The situation was aggravated by the closure of the road and the conversion of pastures to arable land. The peasants attacked the monastery, stormed the chancellery and freed the fellow villagers who were detained there. The head of the district arrived in the village accompanied by an armed squad, 17 peasants were arrested.

In 1921, the villages of Dvani and Avnevi joined the Dirbi community. Dirbi community was included in Ruisi region of Gori district.

By 1804, 64 families lived in Dirbi. The serfs belonged to Mroveli and Machabeli. It is a big village. According to the 2014 census, 2569 people live in the village.

There are many architectural and archaeological monuments in the village. Among them are the Late Bronze-Early Iron Age Zenajvri Hill, the Feudal Age Tomb, the Three-Nave Basilica of the Mother of God and its complex, the 19th century Church of All Saints, the 17th-18th Century Castle Hall, the Late Feudal Age St. George Church, the 10th Century St. George Zedajvri Church, Saint Theodore Church of the 19th century. The reconnaissance expedition of Shida Kartli in 1955 traced the Late Bronze Age settlement on a hill in Dirbi.

The following monuments/objects of cultural heritage are located in the vicinity of Dirby village:

Complex of the Church of the Mother of God of Dirbi - a church complex in the village of Dirbi, Kareli municipality. It is located on the outskirts of the village, on the mountain slope, on the left bank of the East Prone river, in the place Serebi. It dates back to the earlier and later feudal times. The complex includes: the Church of the Mother of God, a bell tower, a rampart and the remains of various buildings.

The Church of the Virgin Mary (7.7X10.3 m) is currently a three-nave basilica. Initially, there was a small hall building, from which the entire eastern facade, part of the western facade and some sections of the interior have survived in their original form. As it is clear from the inscription on the eastern facade, it was built between 957-967 during the reign of the Abkhaz king Leon III. At that time, Kartli was ruled by Ioane Eristavi, an official of the Abkhaz king, who is mentioned in the inscription after the king. Abraham the deacon appears to be the initiator of the construction of the Dirby church. The direct executor and financier of the construction of the church is someone Otinisdze, who together with other co-financiers, took care of this work. The church was built quite quickly. They started building it on March 25, the Annunciation day, and brought it to the beginning of the vault on September 13. The church was built of well-worked blocks of mature burgundy basalt; Bricks were used during the reconstruction. The entrance to the church is from the south annex. The created space is divided into three naves. A pair of semicircular arches separates the side and middle naves. The arches rest on massive square piers and the east and west walls. The original height of the interior is preserved. All three naves have small quarter-circle apses to the east. The arches of the apses are arrow-shaped. In front of the apses there are low brick plastered iconostases. The walls of the church were plastered and completely painted.

The church belonged to the Monastery of the Tomb of Christ in Jerusalem (it represented its Metochion).

Dirbi settlement - archaeological monument in the territory of the village of Dirbi, Kareli municipality. It dates back to the late feudal period. During the earthworks, fragments of red-burnt rough clay vessels, fragments of a large kvevri and others were found.

Dirbi Tomb - an archaeological monument in the north-west of the village of Dirbi, Kareli Municipality, in location Nafudzarebi. It dates back to the feudal era. A dead body was buried in a clay coffin with its head facing east. The archaeological material is preserved in the historical-ethnographic museum of Gori.

Dirbi Castle - an architectural monument on the north-east side of the village of Dirbi, Kareli municipality, on the mountain. It dates back to the end of the 17th century and the 18th century. It is built with cobble stone. The elongated territory of the castle hall (29.7X9.6 m) is intensively developed. At its narrow ends, there is a tower, and in the middle, a three-story building's (house) roof was used as a courtyard. The only entrance was from the east side of the yard.

There are only windows in the walls of the first floor of the three-story building, and in the walls of the upper two floors - windows, crenelles and fireplaces. Thus, the building was both a residence and a defense at the same time. The walls are 1 m thick. The east wall is reinforced externally with three buttresses.

The north quadrangular tower has five floors. It is better preserved. The first floor is a utility room with brick walls. Half of this floor belongs to the first construction layer, the rest was built later. The first, second and third floors of the tower have separate entrances from the courtyard. These floors are equipped with household elements, and also have crenelles. The fifth floor is a combat roof. It has high battlement walls.

The small tower (4X5 m) is semi-round; It is heavily damaged, three floors are partially preserved. There are windows and crenelles on all floors, there is also a fireplace on the second floor.

It is known that in 1736 the army of Leki was fortified in the castle of Dirby, but soon they escaped.

Zenajvari Gora - an archaeological monument in the village of Dirbi, Kareli municipality, 400 meters to the south-west. It dates back to the Late Bronze, Early Iron Age. Zenajvari Gora is single-layered. On the hill, you can find black-burnt shavprila, pieces of glossy clay, as well as fragments of a hand grinder.

Tsveri - a village in Georgia, in the Kareli municipality of the Shida Kartli region, in the community of Breti. It is located on the Shida Kartli plain, on the right bank of the East Prone River. 700 meters above sea level, 7 kilometers from Kareli. The village is mentioned in the 1794-1799 census of Ioane Bagrationi. Alexander and Grigol Kipshidze were born in the village.

According to the 2014 census, 592 people live in the village.

The following monuments/objects of cultural heritage are located in the vicinity of Tsveri village:

Tsveri settlements and church - an archaeological monument in the village of Tsveri, Kareli municipality, in the northeast of the Eastern Prone River, on an elevated site. It dates back to the feudal era. The area is 1.5 hectares. Clay and tile shards are collected on settlements (ploughed and seeded). On the top of the elevation there are ruins of the church (Tsveri Trinity). There was a cemetery in the yard of the church surrounded by a wall.

Tsveri Mound - an archaeological monument three kilometers from the village of Tsveri, Kareli municipality, on the edge of Dedoplis Mindori (the Queen's field), in the north, on the Kvernaki mountain. This place is called the cross of blood. It dates back to the Bronze Age. The hill is surrounded by a circular fence made of coarsely broken cobblestones.

Breti - a village in Georgia, in Kareli municipality of Shida Kartli region. Community center (villages: Aradeti, Doglauri, Sagholasheni, Tsveri). It is located on the Shida Kartli plain, on the left bank of the East Prone River. 710 meters above sea level, 9 kilometers from Kareli.

It is known that one of the thirteen Assyrian fathers, Pyros Bretheli, founded a monastery here. The monastic center established by him here was an important cultural-educational, scribe, and handicraft center throughout the Middle Ages. The 11th century Breti silver war cross with an inscription, the 13th century Breti leather gospel and others were created here. The monastery of Breti played an important role in the cultural promotion of the population of the village and the Breti Gorge. Breti Gorge and the village of Breti were directly subordinated to the Georgian royal court during the period of state unity of feudal Georgia (XI-XIII centuries). At the turn of the 14th-16th centuries, Alexander I donated the Breti ravine to the Svetitskhovli monastery. In the 15th-16th centuries, a part of Breti Khevi and even the village became subordinate of Urbnisi monastery. Here it owned a considerable number of serfs and

had an estate manager. In the 17th-18th centuries, after the establishment of the Avalishvili family headquarters in Zemo Kartli, a large part of Breti village was owned by the Avalishvili family. They owned the Borjomi valley and were entrusted by the king with the protection of Dvani Prone. Due to the unyielding nature of the Borjomi valley, the king them Breti as far as Dirba. They also had a palace here. According to the administrative-territorial division of the 16th-18th centuries, Breti was included in Zemo Kartli Sadrosho, which was commanded by the Amilakhvaris. The village is mentioned in the 1794-1799 census of Ioane Bagrationi. By 1804, the serfs of Breti belonged to Avalishvili, Tsereteli and Queen Daria.

According to the 2014 census, 899 people live in the village.

The following monuments/objects of cultural heritage are located in the vicinity of Breti village:

The Church of Father Pyros of Breti - a monument of Georgian architecture, is located in the village of Breti, Kareli municipality. The monastery was founded in the 6th century by Venerable Pyros, whose holy relics rest in the same church. On November 7, 2006, according to the decree of the President of Georgia, it was awarded the category of immovable cultural monument of national importance.

Toponym, Breta - dates back to the time after the foundation of the monastery here. Breti must be originated from the word Bereti. This, most likely, was pointed out to the size of the monastery, the number of monks. However, today there are no traces of other monastic remains around the church, but earlier there were "fraternal burials" here.

The Church of Father Pyros has been rebuilt, it is connected to St. George's Church and leaves an impression of an annex. Today's St. George's Church of Breti belongs to the VIII-IX centuries. However, it was not built at once. Its northern annex originally represented the independent church of Father Pyros (chapel). This annex building must have belonged to the time of Pyros. This small one-nave building was destroyed early, but its remains were preserved, repaired and organically connected with the later building. Inside the entrance there is a staircase, the steps of which are actually tombstones with inscriptions. In the late feudal age, the church was thoroughly repaired. The upper parts of the building were built with cobblestones and bricks, and the building was rebuilt. The bell tower, which is built on the southwest corner of the building, was also built in this age. The church was also repaired in the 19th century: the outside was completely plastered, covered with tiles, the walls were rearranged in many places and the destroyed parts were rebuilt, the cornices of the annexes were restored with square bricks. The cornice of the main nave is also from the 19th century.

During the Soviet period, as in many other churches, the liturgical service was stopped, and the church was turned into a food warehouse. At the end of the 20th century, the visual appearance of the Church of Father Pyros was deplorable: the roof was collapsed, the apse shell was collapsed, the floor was collapsed, the lining was torn off, the interior of the church was filled with earth and stones. The building was last repaired in the middle of the 20th century. The monument, as far as possible, has returned to its original appearance.

The chape had only one door on the south side. It still exists today and is the entrance to the main nave. A narrow window is cut in the sanctuary. It has a rectangular shape both from the outside and from the inside. There was a similar window in the west as well, but it was sealed. Quite large sections of the facades are also original.

The belfry is a brick-built six-arch pavilion with a round base and a pyramidal roof.

Monastic life was revived in Breti and today there is a nunnery here.

Church of St. George of Breti - a church in the village of Breti, Kareli municipality. Located in the center of the village, the church dates back to the 6th century. On November 7, 2006, according to the decree of the President of Georgia, it was awarded the category of immovable cultural monument of national importance.

The church is a hall building (14.35X13.2 m). In spite of numerous reconstructions, the building's plan, masses and individual forms remain unchanged. The church has three entrances - north, south and west. The interior space is quite spacious. There is a wide window on the axis of the semicircular apse, and deep niches on both sides. The longitudinal walls of the hall are divided into two parts by two-level pilasters. The middle step supports a vaulted arch, and the side steps support decorative wall arches. The church is adjoined to the north by chapel (Church of Father Pyros), and to the south and west by annexes.

Church of Father Pyros (chapel) and the eastern facade of St. George's Church is built with almost the same building material, but the walls are unjoined, the arrangement is different. Traces of the pediment can also be seen on the chapel. Later, the corners of the chapel were raised, the building was covered with a flat roof and was connected to St. George's Church. The facades of the chapel have been renewed several times. Old parts are preserved in the form of fragments. The interior of the building has also been remodeled. The vault has been restored. The apse and the lower parts of the wall are unchanged. There is a narrow window on the axis of the deep, fluted apse. The only door cut to the south leads into the main church. The southern and western annexes are continuously connected to each other and surround it. Both are covered with a semi-circular vault made of limestone. The south annex has a semicircular apse. You can get to St. George's Church through the entrance cut in the south wall of the annex.

Later, a belfry was built on the south-western corner of the surrounding annex - a six-arched brick pavilion with a round base and a pyramidal roof. Every facet of the pavilion is decorated with decorative shafts and arches.

Breti Church - a church in the village of Breti, Kareli Municipality. It is located in the west of the village, on the plateau, in the territory of settlement Tsveri. The church dates back to the XVI-XVII centuries.

The church has a hall (8.6X4.6 m), built of cobble stone and brick. It has an entrance from the south. There is one window and two niches in the semicircular apse. The hall is covered with a vault. Conch and vault are lancet-shaped. The west and south walls have a window each. The building had a jagged brick pavilion. The two-tone roof is tiled. Later on the western wall of the church, a watch tower was built, which was due to the favorable strategic location of the plateau.

Sagholasheni - a village in Georgia, in the Kareli municipality of the Shida Kartli region, in the community of Breti. It is located on the Shida Kartli plain, on the left bank of the Eastern Prone river. 650 meters above sea level, 6 kilometers from Kareli. The Church of the Dormition of the Virgin of Sagholasheni is located in the village. The village is mentioned in the 1794-1799 census of Ioane Bagrationi.

In the Georgian historical sources, it is found for the first time only in the "Deed of Surnames of the Amirejibis" of the 15th century. At the beginning of the 15th century, Kutsna Amirejibi, the famous Georgian statesman and politician of that time, bought his son Ramin Sagholasheni. In the second half of the 15th century, the Amirejibis donated the village to the Church of the Virgin of Ulumbi, but in the 16th-18th centuries, the Amirejibis owned the village. In the second half of the 18th century, the Taktakishvili family also got a share of the village's serf estate. From the historical documents of the late feudal age, it can be seen that the village was economically quite strong. There were especially many mills in Sagholasheni.

According to the 2014 census, 452 people live in the village.

The following monuments/objects of cultural heritage are located in the vicinity of Sagholasheni:

Church of the Assumption of the Virgin Mary of Sagholasheni - the church named after the Mother of God in the center of the village of Sagholasheni, Kareli municipality, on the edge of the highway, on a raised hill. It dates back to the developed feudal age, it was rebuilt in the 19th century. Two main construction layers are distinguished. To the earliest belong the plan of the church and the lower parts of the walls, which were built of coarsely broken, smoothed grown boulders. Brick, crushed stone and cobblestone were used as building materials during the repair. The church has two entrances - south and west. There is a narrow window on the axis of the semicircular apse. From the beginning, the church had an annex on the south side. A wide door cut into the western section of its southern facade was the original entrance to the church. Door jambs are made of cut stone (XIX century). There is a semicircular decorative arch on the two-sided front. In the southwest, in the corner created between the church and the annexes, there is an arm (19th century), which was connected to the church openly. It is covered with a double high roof. The church is covered with tiles.

On the west door of the church in the 19th century, a massive storehouse (4.1X3.1 meters) built of cut stone was built, the southern entrance of which is a solemnly decorated portal with a semicircular arch and other decorative elements. On the storehouse stands a belfry with a four-pillar, open arch on all sides. It has a hemispherical dome and a conical roof.

In the church there was preserved a remarkable example of goldsmithing, stone tiles of Sagholasheni (beginning of the 11th century). It is kept in the Art Museum of Georgia.

Church of Sagholasheni - archaeological monument, at the end of the village of Sagholasheni, Kareli municipality. On the north-eastern part of the Eastern Prone River, on the elevated ground. 50 meters from the highway, at the village cemetery. It dates back to the feudal era. The area of 500 square meters shows the remains of the wall and the foundation of the church.

Bebnisi - a village in Georgia, in the Kareli municipality of Shida Kartli district, the center of the community (villages: Apnisi, Gombori, Zemo Leteti, Kvemo Leteti). It is located on the Shida Kartli plain, on the left bank of the Mtkvari River. 640 meters above sea level, 2 kilometers from Kareli. There is a church of Theodore Tiron in the village.

According to the 2014 census, 1251 people live in the village.

It is mentioned for the first time in historical sources in a document dated 1609: Atabag Manuchar of Samtskhe donated "Khuranielni", a resident of Bebnisi, to the church of the deity of Ruisi as a gift to remember his mother, Simon I's daughter, Helen. It says:

"Completely Khurani people, close inhabiting Bebnisi, and when they are in this country and come from there...whoever encroaches for change...what right is on the estate of Meskhurians and Javakhuris". It is these people whom Manuchar donated to the deity of Ruisi.

Vakhushti Batonishvili and Ioane Bagrationi have included Bebnisi in the list of villages of Liakhvi valley.

Bebnisi was a church village. In 1804, 18 households (138 people) lived here. 15 of them belonged to Ruisi Church of God, 2 to Machabeli, and 1 to the Catholicos.

The following monuments/objects of cultural heritage are located in the vicinity of Bebnisi:

Beriklebi settlement - archeological monument is located in the northeast of the confluence of Mtkvari and East Prone Rivers, at the location of Berikldeebi. Excavations were carried out in 1979-1983.

In the 2-meter-high cultural layer in the trench cut on the mouth of the settlement, the remains of 4 periods were revealed: a weak layer of the Late Bronze Age settlement - traces of cobblestone buildings and fragments of typical black ceramics; Remains of inlet tombs of the Middle Bronze Age, black, gray and light colored (Uzerliktefe type) ceramics; Two construction horizons of the settlement of the Bedena culture fortified by the adobe wall - faint traces of the adobe and picket-wattle buildings, rectangular clay sacrificial platforms, high-quality black glossy Bedena ceramics, as well as ordinary chestnut-colored and pale clay vessels, a fragment of a bronze ax, stone and bone weapons; Settlement remains of the early stage of the Early Bronze Age, Ruins of a burnt circular building with a disk-shaped terracotta central hearth, a ritual cylindrical vessel, terracotta platforms and typical pottery fragments among them; Bedena layer of Berikldeebi is dated by the C14 method to 2900 B.C. The material found on the site is preserved in the State Museum of Georgia.

Berikledei burial ground - on the second terrace of the Mtkvari river, in the same place where the settlement is located, there are about 50 mounds (mountain burials), the diameter of the largest of which is 50 meters, and the height is 2.5 meters. In 1980–1982 were excavated (led by Iulon Gagoshidze) four pit and inhumation hill burials. Two mounds were dated to the Early Bronze Age (18th-21st centuries BC), one to the Middle Bronze Age (beginning of the 2nd millennium BC), one to the transitional period from the Middle Bronze to the Late Bronze Age (15th century BC). The archaeological material found in the burial ground is very similar to the Korghan culture monuments of Trialeti. It is the first monument in Shida Kartli, where so called kurgan containing Bedena type ceramics was excavated. In Korgani, the dead were buried in a four-wheeled cart tied to oxen. In addition to ceramics, a bronze dagger, a bronze clothes pin with a silver covering, and beads were included.

Gori Municipality - administrative-territorial unit in eastern Georgia, in Shida Kartli area. Administrative center - Gori.

Gori municipality is located in the central part of eastern Georgia, on the Shida Kartli plain. Mtkvari, Liakhvi, Tana, Thedzami rivers flow in its territory. The resorts of local importance are Gorijvari and Boshuri.

The municipality is bordered by the territory occupied by the Russian Federation (Tskhinvali region) in the north, Caspi in the east, Kareli in the west, Borjomi and Tsalka municipalities in the south.

City - 1: Gori,

Rural community - 21.

Village - 137.

The territory of the current Gori municipality was the historically advanced region of Shida Kartli ("Zena village"). It represented the central part of Georgia – “Kvekana” (Country). The main roads of Georgia intersected here. In the territory of the current Gori municipality, human footprints of the Upper Paleolithic age have been preserved only in the form of individual fragments. The area was intensively exploited in the Early Bronze Age. During this period, the expansion of some areas and the tendency of certain micro-districts to become the center (for example, Gudabertka) can be observed. By the Early Antiquity period (VI-IV centuries BC), several state formations arose in Eastern Georgia, one of them was "Zena Village", whose center was located in the vicinity of Uplistsikhe. In the era of earlier feudalism, the part of the territory of the present Gori municipality located to the south of Mtkvari was part of Tanishkevi, and the northern part belonged to Rekha, Gverdisdziri, Satskhumeti and Achabeti gorge. In the 10th century, one historical-geographical "country" was formed on the left bank of the Mtkvari (center - Uplistsikhe), another "country" was formed on the right bank of the Mtkvari, called Rati Bagvashi Saeristavo (center - Ateni). In the 12th-13th centuries, the palaces of the kings of the united Georgia were located in Nacharmagevi (now Karaleti). From the 15th century, the territory of the present

Gori municipality was part of Saamilakhvro, Samachablo, Ksani Saeristavo and Satsitsiano. From the 16th century, the Kingdom of Kartli was divided into four military-administrative units - Sadrosho or Sasardlo. The territory of the region was included in the second and fourth sadrosho, where the feudal house of Amilakhvaris stood at the head of one, and the representative of the feudal house of Tsitsishvili stood in the second one. From the point of view of church governance, the territory of the current Gori municipality was divided among the Mtskheta Patriarchate, Nikozi, Ruisi and Mtskheta bishoprics. Gori District was created in 1802.

Gori district was created in 1930. By the 1991 law, the former Tskhinvali region joined it, however, due to the Georgian-Ossetian conflict, the law was not practically enforced. Since 2006, the old borders have been called Gori Municipality.

Arashenda - a village in eastern Georgia, in Gori municipality of Shida Kartli region (Variani community). It is located on the right bank of the Didi Liakhvi river. 690 meters above sea level, 11 kilometers from Gori. According to the 2014 census, 646 people live in the village.

village The following monuments/objects of cultural heritage are located in the vicinity of Arashenda:

Church of the Archangel of Arashenda - a church in the south-east of the village of Arashenda, Gori municipality, on the mountain. It dates back to the developed feudal age.

The church has a hall (9.2X5.3 m), built of cobblestone. The corners of the building, pilasters, door and window edges, cornices and arches are made of hewn stone. The entrance, rectangular from the outside, arched from the inside, is in the western part of the south wall. In the semicircular apse there is a narrow window on the axis, on its left side - an arched niche. Under the window of the apse there is a table stone, in front of the altar - a stone iconostasis with an arched entrance. To the left of it is a lancet-shaped niche. There are rectangular windows on the inside and arched windows on the outside in the south and west walls. The vault-supporting arch rests on a pair of two-tiered pilasters of the longitudinal walls. The church is plastered from the inside. On the southern facade, on the architrave of the entrance, there is a cross with equal arms. On top of the pediment of the eastern facade is a sheep's head carved out of stone. The building is surrounded by a shelf-like conrice. The roof is two-tone, covered with stone tiles.

Church of the Transfiguration of Arashenda - a church on the edge of the village of Arashenda, Gori municipality, in the east, in the cemetery. It dates back to the developed feudal age.

The church has a hall (7.1X5 m), built of cobble stone and brick. The windows are carved in whole cut stone. The arched entrance is in the western part of the southern wall. There is a narrow arched window on the axis of the irregular semicircular apse, right-angled niches on both sides of the window. Below the northern niche is a stone-built pedestal. There are windows in the western wall and the eastern part of the southern wall. The supporting arch of the cylindrical brick vault rests on the brackets of the longitudinal walls. The church is plastered from the inside. A stone with a cross relief is embedded in the hump of the eastern facade. The church is surrounded by a cornice made of two rows of bricks.

Sasireti - a village in Georgia, in the Kareli municipality of the Shida Kartli region, in the Giganti community. It is located on the plain of Shida Kartli. 710 meters above sea level. It is 10 kilometers away from Kareli.

According to the 2014 census, 304 people live in the village.

Sakasheti - a village in eastern Georgia, in Gori municipality of Shida Kartli district (Variani community). It is located on the plain of Shida Kartli. 710 meters above sea level, 18 kilometers from the Gori.

On March 23, 1784, Suleiman Pasha attacked Kartli with three thousand leks and completely conquered Sakasheti along with other villages.

On November 18, 1905, a meeting was held in the village square, which was attended by peasants from neighboring villages. The decisions of the meeting included demands: to release political prisoners from prisons; to abolish military rules in Saratov, Chernihiv, Tambov and other provinces and in the Polish Crown; to withdraw the Cossacks and army units from the villages; to hold the constituent assemblies of all Russia and outer countries; to give land to the peasants in public ownership; to punish officials who attacked and destroyed the villages of Gori district.

According to the 2014 census, 883 people live in the village.

The following monuments/objects of cultural heritage are located in the vicinity of Sakasheti:

Church of the Virgin of Sakasheti - a church in the center of Sakasheti village of Gori municipality. It dates back to the 18th century.

The church has a hall (12.6X8.3 m), built with alternating rows of cobble stone and bricks. Reddish stone blocks are used in the corners. Arched door jambs are also made of stone. The entrance is to the south and west. In the semicircular apse there is one window and two large niches. Two large windows are in the south and north walls in each. The hall is covered with a cylindrical vault. The church has a sloped roof of blue grooved tiles. A brick belfry is annexed to the western wall.

St. George's Church of Sakasheti - a church one kilometer south of the village of Sakasheti, Gori municipality, in the cemetery. It dates back to the late feudal period.

The church has a hall (6.9X5.1 m), built of cobble stone and brick. It has a door to the south. There is one window in the east, south and west walls each. The hall is covered with a cylindrical vault. The roof is sloping.

The first mound of Sakasheti - an archaeological monument in the village of Sakasheti, Gori municipality, on a local hill. The mound was discovered by chance during land cultivation in 1961. The archaeological monument dates back to the Bronze Age. The monument is damaged. According to tradition, several dead were buried in the mound. The manner of burial is unclear. Next to the bones of the deceased, black-burnt clay pots of various sizes were found, which are currently missing.

The second mound of Sakasheti - an archaeological monument in the village of Sakasheti, Gori municipality, on Khatinatkha location. The archaeological monument dates back to the Bronze Age. Korghan is made of stone, its diameter is 40 meters, and its height is 2 meters. Korgan is poorly protected.

Sakasheti tomb - an archaeological monument in the village of Sakasheti, Gori municipality, in Tsotskhebi, in the village cemetery. The tomb dates back to antiquity. The archeological monument was discovered by chance during land cultivation in 1973. The burial position of the deceased found in the tomb is unclear. A red-burnt clay wine drinking vessel with a glossy surface and a handle was discovered (it is kept in the local history corner of the Tseronisi village school, Kareli district).\

Sakasheti burial ground - an archaeological monument in the village of Sakasheti, Gori municipality, in Gorana (the same as Chakirulebi). The burial ground dates back to the Late Bronze Age. The archeological monument was discovered by accident, during the cultivation of the land. The deceased was buried in the tomb with his hands and feet folded, his head facing the northwest. On the territory of the tomb, there are fragments of black-burnt, rough-cut pottery of various sizes.

Variani - a village in eastern Georgia, in the Gori municipality of Shida Kartli district, on the Shida Kartli plain, on the right bank of the Liakhvi river, on the Gori-Nikozi-Tskhinvali highway. Community center (villages: Arashenda, Akhaldaba, Sakasheti, Variani farm). 680 meters above sea level, 12 kilometers from Gori.

In the feudal age, the village and its surroundings played an important role in the economic and political life of Kartli. Agriculture was developed here. In the late feudal age, Variani was an important strategic point in the battles against the enemy who entered Georgia. In 1789, the Variani peasants, harassed by feudal lords, lords and king's officials, appealed to Erekle II.

According to the 2014 census, 1469 people live in the village.

The following monuments/objects of cultural heritage are located in the vicinity of Variani:

Church of the Mother of God of Variani - a church in the center of the village of Variani, Gori municipality. According to the inscription, it was built in 1835.

The church has a hall (13.9X7.5 m), built of cobble stone and brick. The entrance is from the south. On the axis of the semicircular apse, there is an arched window from the inside and a rectangular window from the outside. On the left side of the window there are two medium-sized rectangular niches, and on the right side there is one rectangular high niche. The south and west walls have two windows each, arched from the inside, and rectangular from the outside. Below the windows in the eastern part of the longitudinal walls of the hall, there is a lancet-shaped niche. Between these niches and shoulders, an icon insert is drawn out by plastering. There are pilasters on the longitudinal walls, which support the arches of the semicircular vault. In the western part of the building there is a wooden gallery. The staircase leading to the gallery is placed in the western wall. The church is plastered inside and outside. On the south facade, the arched entrance is set into a rectangular recess and finished with a three-tiered brick frieze. Above the entrance is a sunken cross with a pile of bricks. Between this cross and the entrance, a construction inscription is carved into the sandstone. The windows on the facades are finished with pediments. A cross is depicted on the pediment of the eastern window. On the roof of the church, to the west, there is a small brick bell tower with arches on all four sides and a brick pyramidal roof.

The Church of the Virgin of Variani - a church in the northeast of the village of Variani, Gori municipality, in the place of Futuroebi, in the cemetery. It probably dates back to the X-XI centuries.

The church has a hall (12.3X6.8 m), built with large cobblestones, structural parts are made of brownish tufa. The church had three entrances. In the western part of the northern wall there is an arched door covered with a tympanum. Only the jambles of the southern and western entrances have been preserved. There are arched windows on the axis of the horseshoe-shaped apse. The second window is in the eastern part of the south wall. On both sides of the apse, in the wall, at a height of about 2.5 m, there is an pastophorium and a deacon's room, which is a peculiarity of the church. There are narrow arched windows in the apses. There is a rectangular niche in the deacon’s room. On the first step of the two-level pilasters of the hall are the wall arches. On the eastern facade, the left ornamented headstone of the altar window and the plain headstone, as well as the relief-headed headstone of the left small window have been preserved. The south window was also framed with an ornamented facade similar to the window of the altar, of which only the lower parts have survived. The heavily damaged Asomtavruli inscription on the tympanum of the northern door belongs to the 10th-11th centuries.

Variani settlement - an archaeological monument 1 km northeast of the village of Variani, Gori municipality, in the location Tskarostavebi. It dates back to the late feudal period. There are ruins of several houses left in the village. The remains of the foundation are built with cobblestones. Fragments of red-fired clay vessels typical of the late feudal period, large artefacts and others. According to

tradition, the population was expelled from here during the Leki invasion (XVIII century). In the second half of the 19th century, the Kereselidzes from Racha settled in these places, who then moved to the village of Variani.

Identification of cultural heritage receptors adjacent to the project area, description of sites, status and significance

The project area is located in the territory of Kareli and Gori municipalities and includes the surrounding areas of Kareli and villages of Dzlevijvari, Dirbi, Tsveri, Breti, Sagholasheni, Bebnisi, Urbnisi, Ruisi, Arashenda, Sasireti, Sakasheti and Variani.

The project area (area 10X10 km) is an area of almost square shape (thick, red figure on the map), which is represented by four main (corner) boundary points. According to the provided coordinates, we tentatively called these points Point1, Point2, Point3 and Point4. [9] The location point of the turbines (the same as the masts) was given as a yellow mark and we left it like that; Roads by which the turbines should be connected to each other and/or by which the transport should reach the turbines are indicated by blue lines; The electricity cable connecting the turbines, which according to the project should be buried in the ground - is marked with red lines; The physically possible working area of the place where the turbine is located is presented as blue rings; Purple and white lines represent the areas adjacent to the turbine placement area, where, within the project, it is also possible to plan earthworks; The orang line on the map shows approx. 4 km long section, which crosses Tbilisi-Senaki-Leselidze highway E60 (GPS coordinates of the place: 410420.17 m E, 4655528.48 m N) and runs from the north-east of Kareli to the north-west of Ruisi village.

It falls within the total project area (largely) and extends a little on the northern side, having a rhombic shape of approx. 2.3 km long and 1.4 km wide area (approx. 298 ha) - green rhombus on the map. Six turbines may be located in this area (their conventional numbering is as follows: T38, T40, T39, T27, T35 and T47). The roads connecting these turbines to each other and to the plots of land located in the village area and the directions of the electricity line connecting the turbines to each other were not given, while for the rest of the territory they were already marked (see above).

Points marked on the maps (fig. 1; 2 qnd 3 in annex 2 at the end of this CH Report):

White marks - the four main (corner) boundary points of the project area;

Yellow mark - locations of masts determined according to the provided coordinates;

Green marks - cultural heritage monuments and/or objects included in the agency's document repository (base), whose location is precisely known;

Red marks - cultural heritage monuments and/or objects included in the agency's document repository (base), whose exact location is not known;

Blue marks - cultural heritage monuments and/or objects included in the agency's document repository (base), which have been assigned the category of national importance;

Flag-marked - areas considered by us to be noteworthy archaeological sites. Also the area where the archaeologist's supervision will be required during the earthworks.

Below are the cultural heritage monuments and objects located in the territory of Kareli and Gori municipalities, which are located closest to the area under consideration of the project area and which are listed in the database (base) of the National Agency for the Protection of Cultural Heritage of Georgia:

Church of the Virgin Mary.

Registration number: 17589.

[9] Any interesting sections/points located in the entire project area (be it border points, roads, power lines, monuments/objects or areas of interest) are presented in the form of an appendix (Annex 1, Table 1-5).

District/municipality: Kareli

Settlement: Kareli.

GPS coordinates: 408291.00 m E, 4652667.00 m N - to be confirmed.

Date: XIX century. (1850).

Initial Status: Object without status.

Current status: cultural heritage monument (30/03/2006, N3/133, Ministry of Culture, Monument Protection and Sports of Georgia).

Original Category:-

Current Category: Object/Monument Uncategorized.

The Church of the Virgin Mary stands in the north of the city.

Brief description: according to the construction inscription, it was built in 1850 by order of Fanaskerteli-Tsitsishvili, son of Eustatis. The church is damaged. During the repair, it was covered with tiles (on wooden structures). The church has a hall (15.7x9 meters). It is built with cobble stone and brick. It has two entrances, south and west. Both entrances are rectangular inside and outside, covered with an architrave. The deep semicircular apse has an arched window on the axis, with wide arched niches on both sides. Inside and below the northern niche is another small niche in each. The sanctuary is elevated by two steps. There are two wide arched windows in each the south and north walls. In the north-west corner of the church, in the thickness of the wall, there is a rectangular room, which has an arched entrance at the hight of 2 m from the outside. The storeroom was connected to the church hall through an opening (now sealed). On the longitudinal walls of the hall there is a pair of two-tiered pilasters. The first level of pilasters support decorative arches of the wall, the second level supports vaulted arches with shelf capitals at the heels. There are three semicircular niches on the eastern facade of the church. Indented crosses are depicted between the niches. On the south facade, on both sides of the entrance, there is a pair of pilasters. On the right, between the pilasters, there is a window, and below it is a niche (sealed). On the left side of the entrance, between the pilasters, there is an indented cross above, the entrance below (stoned). A construction inscription is carved on the stone of the architrave of the southern entrance of the church.

According to the coordinates (which, as mentioned, need to be clarified), the monument is located in the project distribution area, 2.3 km south of the location of the nearest towers (T57, T25).

Berikldeebi village and burial ground.

Registration number: 21018.

District/municipality: Kareli.

Settlement: Bebnisi.

The village of Berikldeebi and its burial ground are located in the northeast of the confluence of the Mtkvari and East Prone rivers, 3 km west of the village.

GPS coordinates: 409756.00 m E, 4652916.00 m N - to be confirmed.

Date: The period from the Bronze Age to the earlier Iron Age (4th millennium BC - 10th-8th centuries BC).

Initial Status:-

Current Status: Object with no status.

Original Category:-

Current Category: Object/Monument Uncategorized.

Brief description: Beriklebi village and its burial ground are located in the northeast of the confluence of the Mtkvari and Eastern Prone rivers, 3 km west of the village. 1979 During the aerial photo reconnaissance, the archaeological expedition of the Prone (dedoplis mindori - Queen's field) of the National Museum of Georgia (led by I. Gagoshidze) traced the burial mound and the Little settlement. Excavations were carried out in 1979-1983. The settlement (area 4000 sq/m.) is located directly at the confluence of the rivers Mtkvari and Eastern Prone on the crest of a high cape. In the trench cut at the edge of the settlement (area 400 sq/m) in 2 m. deep cultural layer, 4 periods were identified in stratigraphic sequence: 1. The weak layer of the Late Bronze Age settlement - traces of cobble stone buildings and fragments of typical black pottery. 2. Remains of sunken burials of the Middle

Bronze Age, black, gray and light gray ceramics. 3. Two (?) construction horizons of the settlement of the Bedena culture fortified by the adobe wall - weak traces of the adobe and picket-wattle buildings, rectangular clay sacrificial platforms, high-quality black-gloss Bedena ceramics, as well as chestnut and pale clay vessels, a fragment of a bronze ax, stone and bone weapons ; 4. Remains of a settlement of the Early Bronze Age. The ruins of a burnt circular building (diameter 10 m.) with a disk-shaped plastered central hearth, ritual cylindrical vessels, plastered platforms and fragments of typical pottery. The Bedena layer of rocks is dated by the C14 method to 2900 BC on burial ground, on the second terrace of Mtkvari river (area approx. 1 sq/m), there are about fifty burial mounds (Korgani). The diameter of the biggest mound reaches 50 m, and the height is 2.5 m. In 1980-1982 four pits and inhumation hill burials were excavated (supervised by I. Gagoshidze). Two mounds (I, II) were dated to the Early Bronze Age (XXIII-XXI centuries BC), one (III) - to the Middle Bronze Age (beginning of the II millennium BC), one (IV) from the Middle Bronze to the Late Bronze Age with the transition period (15th century BC). Pit burials of the early Iron Age (VII-VI centuries BC) were found in the corners of II and III mounds. Burial ground should be connected with the settlement of BerikIdeebi. In the mound, the dead were buried in a four-wheeled cart tied to oxen. In addition to ceramics, a bronze dagger, a bronze clothes pin with a silver cover, and beads were included. The remains of chariots were also confirmed in mounds II and III. It is worth noting mound IV, dated to the 15th century B.C., surrounded by a circular wall of cobblestones, 40 m. in diameter and 1.5 m. (Kromlekh). The pit (9X4.5 m.; depth - 3 m.) was roofed with poles resting on wooden pillars. In the tomb there was a two-wheeled wooden chariot drawn by two horses, the yoke and head of which are decorated with figured bronze casings and standards with bird and deer statues. Bronze bridles, which are worn in the mouths of horses, are still the oldest among the bridles found on the territory of Georgia. On the chariot lay a bronze so called pre-Asian type of dagger with a frame-like handle, a ritual flat knife with a wooden handle, a leather quiver decorated with bronze plates with up to forty arrows with flint and bronze blades, etc. On the right side of the tomb, a tribal chieftain was buried with bent arms and legs, with sardine beads hanging from his neck and a bronze headdress inlaid with blue and red paste gems and decorated with a thin, ornate plate of gold. A 20-25-year-old woman was buried there, with a silver plate diadem on her forehead, gold, cornelian and glass beads and pendants around her neck, and a gold-headed and silver-handled brooch on her chest. Up to forty ornamented black glossy clay vessels were found in the tomb. Some of them have images of deer, horses and goats. There are ceramic figures of swans on the false handles of the same vessel. Several complete skeletons of a sheep and a pig and the heads and feet of four bulls were found. The heads of the bulls were decorated with cornelian and glass beads.

According to the coordinates (which, as mentioned, need to be clarified), the monument is located in the area of the project, 2.4 km southeast of the location of the nearest towers (T57, T25).

Salariani Church and settlment.

Registration number: 20967.

District/municipality: Kareli

Settlement: Aradeti.

GPS coordinates: 408504.00 m E, 4656787.00 m N - to be confirmed.

Date: Late Middle Ages.

Initial Status:-

Current Status: Object with no status.

Original Category:-

Current Category: Object/Monument Uncategorized.

It is located 1 km southeast of the village, near the Gori-Khashuri highway,. on the bank of the Eastern Prone River.

Brief description: The eastern wall of the church is built on a rock, on a high substructure made of limestone concrete, the arrangement of which is different from the arrangement of the walls of the main body of the building. The church has a hall (6x4.5 m.), built of rubble and cobble stone. The entrance is from the south. The sanctuary is rectangular. There is a narrow rectangular window in the

west wall with a hewn stone jamb on the outside. The interior walls are smoothed and plastered with limestone. The facades are only lined with limestone. There are ruins of villages around the church.

According to the coordinates (which, as mentioned, need to be specified), the monument is located in the project distribution area, 0.46 km west of the location of the nearest mast (T26).

Settlement.

Registration number: 20962.

District/municipality: Kareli.

Settlement: Aradeti.

411559.00 m E, 4657786.00 m N - to be specified.

Date: Late Middle Ages.

Initial Status:-

Current Status: Object with no status.

Original Category:-

Current Category: Object/Monument Uncategorized.

Brief description: The settlement is located 2 km north-east of the village, on a high ground. It is spread over an area of about 500 sq/m. The remains of the church and various buildings can be seen on the settlement.

According to the coordinates (which, as mentioned, need to be clarified), the monument is located in the project distribution area, 1.2 km northwest of the location of the nearest towers (T30 and T38).

A. Proneli's (Kipshidze) residence.

Registration number: 17582.

District/municipality: Kareli.

Settlement: Sagholasheni.

GPS coordinates: 409269.00 m E, 4657195.00 m N - correct.

Date: XIX-XX centuries.

Initial Status: Object without status.

Current status: cultural heritage monument (23/02/2006, N3/46, Ministry of Culture, Monument Protection and Sports of Georgia).

Original Category:-

Current Category: Object/Monument Uncategorized.

Located in the project spread area, 0.17 km southeast of the nearest towers (T32 and T44).

The settlement (coincides with the site of Breti's nunnery).

Registration number: 21021.

District/municipality: Kareli

Settlement: Breti.

GPS coordinates: 409260.00 m E, 4659521.00 m N - in the data archive is noted as subject to confirmation, but coincides with the location of the Breti nunnery.

Date: Middle Ages.

Initial Status:-

Current status: cultural heritage monument (30/03/2006, N3/133, Ministry of Culture, Monument Protection and Sports of Georgia).

Original Category:-

Current Category: National (07/11/2006, N665, President of Georgia).

Short description: There is a village around Father Pyros's and St. George's Church, which dates back to the Middle Ages. The foundations of buildings built with cobblestones, fragments of blue-glazed clay vessels characteristic of the Middle Ages and red-fired, rough clay vessels of the late Middle Ages, as well as fragments of blue-glazed tiles, with which the church of Father Pyros was supposed to be roofed, can be observed.

It is located in the project spread area, 1.0 km southwest of the nearest towers (T11 and T13).

Tsveri complex (church and tower).

Registration number: 21020.

District/municipality: Kareli

Settlement: Breti, Tsveri.

GPS coordinates: 408549.00 m E, 4659181.00 m N - correct.

Date: Church - XVI-XVII centuries; Tower - XVII century.

Initial Status:-

Current status: cultural heritage monument (06/04/2021, N02/20, National Agency for Cultural Heritage Protection of Georgia).

Original Category:-

Current Category: Object/Monument Uncategorized.

Brief description: the complex consists of a church and a tower. It is located in the north of the village, on the plateau (in Tsveri settlement). The church has a hall (8.6X4.6 m.), built of cobble stone and brick. It has an entrance from the south and west. The doors are arched and made of bricks. The west door has been removed after the construction of the tower. In the south, west and east walls, there is one arched and jamb-widenes window in each. The building had a toothed brick cornice, and today a stone shelf cornice is attached to it. It is covered with tiles. The apse is semicircular, separated from the hall by a shoulder. There are rectangular niches on both sides of the window. The conch rests on the triumphal arch over the shoulders. The hall is finished with a cylindrical vault. The interior is plastered. The iconostasis is new, made of stone. Later on the western wall of the church was annexed the church tower, which was due to the favorable strategic location of the plateau (the valley of Mtkvari and the road leading to the south can be clearly seen). The tower is rectangular (4.6x4 m.), built of cobblestones and limestone. The tower has four floors and has a two-tone roof. There are windows/crenelle in the walls at every floor level. The roof between the floors was made of wood. The arched entrance is in the south wall of the 2nd floor. The solid-walled first floor is for commercial purposes; The tower is connected to the church with arches cut on this floor. The second floor is residential and military. In its northern wall, there is a fireplace in the middle, semicircular niches in the corners. To the east, along the window of the church, there is also a window cut here. The 3rd floor is a battle room, in its three walls there are two gun crenelles. The fourth floor has the same solution. After the rehabilitation of the tower, a rectangular window was made in the western wall. In recent years, a stone staircase was built on the south wall of the tower to climb into the tower. There are also the remains of a settlement on the plateau, where ceramic material can be seen in abundance.

The north and west walls of the tower are wet at the first floor level. A metal-plastic window was inserted into the window on the fourth floor of the tower. On the south side of the tower, a stone staircase was built to climb into the tower. A building for church life and a toilet were built a few meters west of the church, which disturbed the historically established environment of the monument.

It is located in the project distribution area, 1.8 km southwest of the nearest towers (T11 and T13).

Temple complex – Dedoplis Mindori (Queen's field).

Registration number: 17579.

District/municipality: Kareli.

Settlement: Breti.

GPS coordinates: (at the base): 404922.00 m E, 4659417.00 m N - to be specified.

GPS coordinates: (from archaeological report): 405081.00 m E, 4658773.00 m N - accurate.

Initial Status: Object without status.

Current status: cultural heritage monument (30/03/2006, N3/133, Ministry of Culture, Monument Protection and Sports of Georgia).

Original Category: Object/Monument Uncategorized.

Current Category: National (07/11/2006, N665, President of Georgia).

Brief description: the temple complex is located between the Eastern Prone River and Western Prone Rivers, 3 km west of Aradeti village. It dates back to 1st century B.C. In 1972-78 the National Museum of Georgia conducted archeological works on the Dedoplis Mindori, and in 1973 G. Chubinashvili Expeditions of the Georgian Art History Institute (led by I. Gagoshidze). The complex includes a system of cult buildings - temenos, residential and commercial buildings for temple servants and priests, temple slave settlements and burial grounds. The place where Temenos was found is known as St. George's niche. Main and minor temples, 6 other temples, gates and several other buildings were discovered here. All the buildings of the rectangular temenos (255x150 m.) are tilted along their longitudinal axis from south to north and slightly (by 6◦) to the west. Its central part is occupied by a square inner courtyard (105X105 m.), which is bordered from the south by the north balcony of the main temple, from the north by the south portico of the small temple, and from the east and west by the gates. The main temple occupies a central place in the southern part of Temenos. It was damaged by a strong fire. The temple is rectangular in plan (46X30 m.), built on cobble stone with adobe (0.5X0.5X0.12 and 05X0.25X0.12 m.). The walls (the remaining height is up to 2 m, the thickness of the capital walls is 1.6 m.) were plastered with a clay-chaff mixture solution and, apparently, were also painted (fragments of red, white and blue painted plaster were found). The main entrance is from the south - through a large, four-columned portico (17.2X11 m.) wide open to the south, which is connected to the central hall by a door cut to the east of the longitudinal axis. In the center of the square cella (17.2X17.2 m.) is a low square platform (1.6X1.6X0.15 m.) for the altar. The floor is made of clay. In the cella and portico stood paired wooden posts plastered with clay on square wooden bases, which were inserted into pits dug in the floor. In the center of the cella, above the altar, was erected a two-tiered crown supported by four free-standing columns with a wide opening in the center. A system of corridors surrounds the portico from the east and west, and the cella from the east-west and north. Corridors (total of 9 rooms) are divided by partitions into three isolated parts, which have independent entrances from the outside (two doors on each side). Two windows are cut in the north wall of each storeroom and one in the east and west walls. The corridor had a plain roof and was covered with red tiles. There are two types of tiles - flat and side-folded. The church has a rectangular loggia-balcony (11X6.5 m.), open on one side, connected to the church by a door. The columns are finished with bell-shaped capitals of incised yellowish-white fine-grained sandstone, on which relief petals of an open lotus flower are carved. The cella, the portico and the balcony were roofed flat with wooden rafters joined together with nails and resting on the columns. In the southern corner of Temenos stood two symmetrically located buildings (each 46 m long). The southern portico of the main temple was flanked by these structures. A small temple is located in the central part of the northern bank of the internal courtyard. The entrance to the temple is from the south, through an open two-columned portico that leads into the inner courtyard and is symmetrical to the north balcony of the main temple. It is connected to the portico cella (7.5X8 m.) by a double door. In the center of the cella stood a single column crowned with a sandstone capital. The altar was arranged at the south-west corner of the cella. A clay platform, similar to the one in the main temple, but smaller (1.1X1X0.15 m.) has been preserved. The cella is surrounded by a walking around area from the east and north. It can also be accessed from the portico. The portico was covered with a two-tone tile roof. A hump tile (width 0.6 m.) is used on the top. To the east and west of the small temple, there are three quadrangular courtyards surrounded by walls on all sides and separated from each other. Three buildings (13x20 m.) separated by a wall were excavated in the northeastern part of Temenos, each consisting of a square room, a corridor to the west of the room, and an open portico on the south side. Temples are surrounded by courtyards from the south and north. Each neighboring temple yard is connected to each other by an exit. These temple complexes are separated from the courtyards to the east of the small temple by a wide street-exit. The north-western part of temenos is symmetrical to the north-eastern part, and three temple complexes have been identified there as well. There are two gates (20x22 m.), they are located to the east and west of the inner courtyard of temenos. Each one consists of two large and two small porticos connected to each other. The large porticoes (internal dimensions 17.2X11 m.) are four-columned and open to the outside. Small porticoes (internal dimensions 11X6.5 m.) have two columns and go into the yard. To the north and south of the small porticos are rectangular rooms (6.5x2 m.) which are connected to the

portico by a door. The capitals of the inner porticoes are similar to those of the minor temple and the north balcony of the main temple. The capitals of the outer porticoes differ from them by abaca ornament. Three-petaled lotus palmettes connected by semicircular stems are carved here, and six-petaled rosettes are inserted between them. The gates were covered with tiles. To the north of Temenos, at a distance of 70 m, 3 m wide wall (fence?) was excavated. Fragments of two stone capitals were found there. Similar remains were discovered west and south of Temenos. To the east of the temple complex, in the area immediately adjacent to it, the remains of cobblestone walls, ceramic products of the II-I centuries and others were confirmed. It is likely that the temple priests' homes and farm buildings were located here. Further east, 1 km from Temenos, to the northeast of so called Dampala Spring, on a low hill, the remains of the palace of the Late Hellenistic period were found. The building was roofed with tiles painted red similar to those used in the temple complex. To the north of the palace, at the foot of the hill, there was a burial ground of the same age. In Late Antiquity and Early Middle Ages, a large village was located on the western slope of the palace hill. Fragments of kvevri and other clay vessels, hand grinders, etc., were found in large quantities at the settlement. To the west of the village, several pit tombs closed with medieval tiles were excavated. 400 m to the northeast of Temenos was revealed workshops belonging to the temple and homes of slave-artisans of II-I centuried B.C. The chamber kiln for firing clay pots is arranged directly in the clay soil. 3 m long ramp descends from the surface of the ground to its vaulted fire pit. To the east of the vaulted kiln, a couple of meters away, there was a second ceramic rectangular kiln (3x1.3 m.). It is likely that it was used for firing tiles. Several agricultural pits were dug around the kilns. To the east of the kilns, at a distance of 50 m, a clay quarry was traced, which was filled with calcareous concretions sorted out from ceramic raw materials and ceramic products that were crushed or broken during transportation. The amount of defective material, as well as the dimensions of the quarry, indicate the large scale of production of the temple workshop. Apparently, a stone-working workshop and forges were located near the ceramic factory. In Late Antiquity and Early Middle Ages, there was a village on the settlement of temple artisans. Cultural layers of IV-V centuries and several pit tombs covered with tiles were studied. During the construction of the irrigation system, a clay sarcophagus of the same period was discovered here. To the south of the craftsmen's settlement and to the west of Temenos, at 280 m, there is a medieval settlement. The remains of half-pithouse buildings were studied. Numerous archaeological materials, 8th century Arab silver dirham, millstone, etc. were found. The discovery of a millstone indicates the existence of a water mill here, and therefore of a stream. Hellenistic and Late Antiquity settlement and burial ground are located northwest of Temenos, at 600 m. Here, on the area of several hectares, fragments of clay vessels were collected in the field. In the tomb, which was damaged during plowing, a red-hot clay jug was found. On the edge of the Dedoplis Mindori, to the east of the so-called "Kvavis Sakdari" (Crow's Church), in the mozvleulebi area, there is a late Hellenistic period settlement and burial ground, which belong to the same age as the church. A variety of archeological material has been found. In the pit graves, in which the dead were laid on their sides, with folded hands and feet, red painted jugs and heeled jars, black glossy clay vessels, colorful stone and glass beads, bronze bracelets and others were found. To the west of the settlement is a burial ground of the ancient times (7th-6th centuries BC). Early medieval tombs (stone boxes) were found south of the temple complex, on the right bank of the Tashiskari canal, as well as in two places: on the edge of the Dedoplis Mindori, in the north, on the southern slope of the Kvernaki series, on the so-called Paraskevas Gora (Friday Hill) and near the Siskhlis Jvari (Cross of Blood). At the so-called Dampalas Tskaro, 600 m southeast of Temenos, there is a Late Bronze Age mound burial ground. In two damaged tombs was found fragments of baked clay vessels from the end of the 2nd millennium. On the eastern side of the Dedoplis Mindori, the remains of a late medieval tower and other buildings have been preserved.

Nearby, during the excavation of the ground, a fragment of a small plaster sculpture of a Parthian craft was accidentally found - a female head with a high headdress and earrings. The statue was gilded, dates back to 1st century BC. On Dedoplis Mindori it was collected superficially and during the excavation it was revealed Old Stone Age flint, argillite and basalt tools and sherds, as well as two Acheulean handaxes. The temple complex discovered on the Dedoplis Mindori belongs to the type of ancient-eastern temples, which were completed in the Achaemenid era (Temple of Fire in Suza, 4th

century BC). The discovery of the entire system of capital cult buildings of the pre-Christian era in the territory of Eastern Georgia confirms the existence of a highly organized pagan cult, a complex cult ritual and a developed temple economy in ancient Iberia.

According to the coordinates (which, as mentioned, need to be specified), it is located outside the project distribution area, 4.3 km to the northwest of the nearest towers (T32 and T44).

Tower-column.

Registration number: 10609.
District/municipality: Kareli.
Settlement: Breti.
Date: Unknown.
GPS coordinates: 409267.00 m E, 4659528.00 m N - to be confirmed.
Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.

According to the coordinates (which, as mentioned, need to be clarified), it is located in the project distribution area, 1.0 km southwest of the nearest towers (T11 and T13).

Father Pyros's Church, St. George's Church and Bell Tower.

Registration number: 6712.
District/municipality: Kareli.
Settlement: Breti.
Date: VI century.
GPS coordinates: 409249.00 m E, 4659514.00 m N - correct.
Initial Status:-
Current status: cultural heritage monument (30/03/2006, N3/133, Ministry of Culture, Monument Protection and Sports of Georgia).
Original Category:-
Current Category: National (07/11/2006, N665, President of Georgia).

Brief description. Two construction layers can be distinguished in the structure: the church of Father Pyros (originally it was an independent building - chapel), which was built in the 6th century by one of the Syrian fathers, the disciple of Ioane Zedazneli, Pyros (buried here) and St. George's Church (main church) VIII-IX centuries. The Church of Father Pyros has been rebuilt, it is connected to St. George's Church and leaves an impression of an annex. The interior of the building has also been remodeled. The vault has been restored. The lower parts of the apse wall are unchanged. There is a narrow window on the axis of the deep, fluted apse. The only door cut to the south leads into the main church. The southern and western buildings are continuously connected to each other and form a walking-around area. Both are covered with a semi-circular vault made of limestone. The south window has a semicircular (deformed) apse. St. George's Church can be accessed through the entrance cut in the southern wall of the building. St. George's Church has a hall (14.35X13.2 m.). Despite the numerous reconstructions, the building's plan, masses, individual forms remain unchanged. The church has three entrances - north, south and west. The interior space is quite spacious. There is a wide window on the axis of the semicircular apse, and deep niches on both sides. The longitudinal walls of the hall are divided into two parts by two-level pilasters. The middle step supports the arch of the vault, and the side steps support decorative wall arches. The church is adjoined to the north by chapel (Church of Father Pyros), and to the south and west by annexes. The belfry is a brick-built six-arch pavilion with a round base and a pyramidal roof. Every corner of the pavilion is decorated with decorative shafts and arches.

It is located in the project spread area, 1.0 km southwest of the nearest towers (T11 and T13).

Burial mound.

Registration number: 21227.

District/municipality: Kareli.
Settlement: Tsveri.
GPS coordinates: 410408.00 m E, 4659177.00 m N - to be confirmed.
Date: Bronze Age (IV-II millennium BC).
Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.

Short description: the burial mound is located 3 km from Tsveri village, on the edge of Dedoplis Mindori, in the north, on Kvernaki Ridge. This place is called Siskhlis Jvari (the cross of blood). The hill is surrounded by a circular fence made of coarsely broken cobblestones.

According to the coordinates (which, as mentioned, need to be specified), the facility is located in the project distribution area, 2.0 km southeast of the location of the nearest towers (T11 and T13). However, it should be noted here that the power line (cable) provided by the project, which will connect the different towers, should go 200 meters away from the possible location of the burial mound (as far as we know, it should be buried in a trench with a width of approx. 0.4-0.5 m). In the above-mentioned location, earthworks must be carried out under the supervision of an archaeologist.

Church of the Virgin Mary.
Registration number: 7973.
District/municipality: Gori.
Settlement: Sakasheti.
GPS coordinates: 414851.86 m E, 4660558.86 m N - correct.
Date: XIX century.
Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.

Brief description: the church has a hall and is built with alternating rows of cobblestones and bricks. Reddish stone blocks are used in the corners. Arched door jambs are also made of stone. The entrance is to the south and west. In the semicircular apse there is one window and two large niches. Two large windows are in the south and north walls. The hall is covered with a cylindrical vault. Internal roofing: arched - vaulted; Cylindrical. The church has a two-colored roof of blue grooved tiles. A brick belfry is built on the western wall. The church has a three-story bell tower from the west.

It is located in the project distribution area, 1.1 km northwest of the nearest towers (T46 and T50).

St. George's Church.
Registration number: 7974.
District/municipality: Gori.
Settlement: Sakasheti.
GPS coordinates: 414233.00 m E, 4659872.00 m N - correct.
Date: XIV-XVIII centuries.
Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.

Brief description: the church is a hall, built of cobble stone and brick. The door is on the south side. There is one window in the east, south and west walls each. The hall is covered with a cylindrical vault. The roof is two-colored. Internal roofing cylindrical.

It is located in the project distribution area, 0.8 km northwest of the nearest towers (T58 and T43).

Tower ruins.

Registration number: 14572.
District/municipality: Gori.
Settlement: Sakasheti.
GPS coordinates: not provided.
Date: Middle Ages.
Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.

Burial Mound Goraka.
Registration number: 14663.
District/municipality: Gori.
Settlement: Sakasheti.
GPS coordinates: not provided.
Date: Bronze Age - year 4th-2nd millennia BC.
Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.

The object is about 1 km away from the village, at the location Goraka between villages Variani and Sakasheti.

Brief description: It was discovered in 1961, by accident, during land cultivation. It dates back to the Bronze Age. It is damaged. According to oral tradition, several dead were buried in the burial mound. The manner of burial is unclear. Next to the bones of the deceased, black-burnt clay pots of different sizes were found.

Burial ground
Registration number: 21031.
District/municipality: Gori.
Settlement: Sakasheti.
GPS coordinates: 415461.00 m E, 4660409.00 m N - to be confirmed.
Date: Bronze Age (IV-II millennium BC); Late Bronze Age (XVI-XI centuries BC).
Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.

The facility is located in location Gorani (the same as Chakiruli).

Brief description: The burial ground was discovered by chance during land cultivation. The deceased was buried with his hands and feet folded, his head towards the north. Fragments of black-burnt, rough-hewn clay vessels of various sizes were found in the territory of the burial ground.

According to the coordinates (which, as mentioned, need to be specified), the facility is located in the project distribution area, 0.96 km northwest of the location of the nearest mast (T55).

the tomb.
Registration number: 21032.
District/municipality: Gori.
Settlement: Sakasheti.
The monument is located in Tsotskhebi, in the village cemetery.
GPS coordinates: 414306.00 m E, 4659876.00 m N - to be confirmed.
Date: Antiquity (5th BC-3rd century BC).
Initial Status:-
Current Status: Object with no status.

Original Category:-
Current Category: Object/Monument Uncategorized.
Brief description: The tomb was discovered in 1973 accidentally, during land cultivation. The burial position of the deceased is unclear. A cup made of red baked pure clay with a glossy surface and a handle was discovered.

According to the coordinates (which, as mentioned, need to be specified), it is located in the project distribution area, 0.8 km to the north-west of the nearest towers (T58 and T43).

Burial Mound of Khatinatkha.
Registration number: 21033.
District/municipality: Gori.
Settlement: Sakasheti.
Burial mound is located in Khatinatkha.
GPS coordinates: 415710.00 m E, 4660818.00 m N - to be confirmed.
the date Bronze Age (IV-II millennium BC).
Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.
Brief description: The burial mound is rocky. It is poorly protected.

According to the coordinates (which, as mentioned, need to be specified), it is located in the project distribution area, at a distance of 0.78 km to the west of the nearest mast (T37).

Cylindrical tower.
Registration number: 5927.
District/municipality: Gori.
Settlement: Varian.
GPS coordinates: 417373.82 m E, 4658639.71 m N - correct.
Date: XVII-XVIII centuries.
Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.
Brief description: 2 km to the northwest of the village, there is a cylindrical tower in the field. The wall of the first floor from the south has been demolished and the floor is filled with rubble. The roofs of the 1st and 2nd floors were dome-shaped. The second floor is rectangular. The arched entrance is in the south wall, on its sides there are lancet-shaped windows with two crenellations. In the east wall there is a large, lancet-shaped niche with a narrow window and a crenellation. On the sides there are small niches with crenellations. In the center of the north wall is a fireplace with one crenellation. There was a staircase built into the wall to the west, which has collapsed. The third floor is literally destroyed. The tower is built of cobble stone with thick mortar. The walls are cracked, part of the first floor has been demolished. The upper parts of the walls have been demolished. The roof between the floors has collapsed.

It is located in the project spread area, 0.37 km west of the nearest tower (T32), and 0.55 km southwest of the location of the T33 tower.

Settlement.
Registration number: 20414.
District/municipality: Gori.
Settlement: Variani.
Date: XVIII century.
GPS coordinates: 417497.00 m E, 4658444.00 m N - to be confirmed.

Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.
Brief description: near the cylindrical tower, in the Lelistavebi area, at the settlement, the remains of the foundations of cobblestone buildings were found. Fragments of red-fired coarse clay vessels and kvevris and others were found. According to reports, the population deserted this area during the Leki invasions.

According to the coordinates (which, as mentioned, need to be specified), it is located in the project distribution area, 0.55 km south-east of the nearest tower (T32).

St. George.
Registration number: 17357.
District/municipality: Kareli
Settlement: Sasireti.
GPS coordinates: 413283.00 m E, 4658087.00 m N - correct.
Initial Status: Object without status.
Current status: cultural heritage monument (01/05/2015, N2/83, National Agency for Cultural Heritage Protection of Georgia).
Original Category:-
Current Category: Object/Monument Uncategorized.
It is located in the project distribution area, 0.8 km northwest of the nearest mast (T41 and T54).

Church of the Virgin Mary.
Registration number: 8029.
District/municipality: Kareli.
Settlement: Ruisi.
GPS coordinates: 414797.00 m E, 4654187.00 m N - correct.
Date: XIX century.
Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.
Brief description: The Church of the Mother of God is located in Kveitshua area. It is a cross-domed building (14.15X9.2 m.), built with alternating rows of bricks and cobblestones. The entrance is on the south (sealed) and west. The church has a small semicircular apse compared to its overall dimensions. The altar is elevated by 0.8 m and has four-step staircases at both ends. There is one wide window and three arched niches in the apse, and on its sides there is a narrow rectangular pastophorium and a deacon's room covered with a semicircular vault. Above them are hiding cells, the front wall of which has been demolished, at the intersection of the arms covered with semicircular arches of the cross, on the walls of the apse and on the two free-standing columns of the west, there is a low vaulted windowless dome (neckless hemisphere). There is one window in each arm of the cross. In the wall of the northern arm, in a wide niche, a baptismal niche is carved. The western arm opens on all three sides with large semicircular arches. The arm vault rests on two supporting curved arches. The vaults of the inter-arm sections are perpendicular to the vault of the western arm. The facades are decorated with decorative semicircular arches and rectangles. The edges of the entrances are made of hewn stone.

It is located in the project spread area, 1.3 km south of the nearest towers (T33 and T35).

Kviriketsminda Church.
Registration number: 8030.
District/municipality: Kareli.

Settlement: Ruisi.

GPS coordinates: 415888.00 m E, 4653996.00 m N - correct.

Date: XIV-XVIII centuries.

Initial Status:-

Current status: cultural heritage monument (18/01/2019, N02/2, National Agency for Cultural Heritage Protection of Georgia).

Original Category:-

Current Category: Object/Monument Uncategorized.

Brief description: the church is located in the northern part of the village of Tsinaubani. It has a hall (10.6X6.3 m.), it is built with cobble stone, basalt was used during the repair (19th century). The walls are plastered inside and outside. The exterior edges of the door and window are made of hewn stone, the roof was originally tiled. The entrance is to the south, the west door is sealed. During the repair, a stone with a grave inscription was placed on the outside of the door as an architrave. There is one arched window on the axis of the semicircular apse. The floor of the altar, which is raised by one step, is bricked. In the south wall, there are two windows, arched on the inside, and rectangular on the outside. In the western part of the hall there was a wooden gallery, which is evidenced by the horizontal pits made for the post in the longitudinal walls. On the east facade, under the pediment, there is a small relief cross. The building is surrounded by a schirm profiled cornice. A four-pillared brick bell tower with a pyramidal roof is built on the pediment hump of the western facade.

It is located in the project distribution area, 0.58 km southwest of the nearest towers (T15 and T18).

Ruisi Mother of God Church Complex.

Registration number: 10630.

District/municipality: Kareli.

Settlement: Ruisi.

GPS coordinates: 413685.00 m E, 4654488.00 m N - correct.

Date: Middle Ages (several construction layers can be distinguished on the church: ancient - VIII-IX centuries; repaired - X century; renovated - XI century; periodical restoration works were carried out on the church including the XVIII century).

Initial Status:-

Current status: cultural heritage monument (30/03/2006, N3/133, Ministry of Culture, Monument Protection and Sports of Georgia).

Original Category:-

Current Category: National (07/11/2006, N665, President of Georgia).

Brief description: The complex of the Cathedral of the Mother of God is located in the center of the village. The complex includes: Cathedral of the Mother of God, bell tower, rampart. According to the tradition, the temple was built by Vakhtang Gorgasali, however, the building of this age did not survive. Several construction layers can be distinguished on the church: the oldest - VIII-IX centuries; Repaired - X; Renovated - 11th century; In the 11th century, the church was decorated by Bishop Giorgi, as evidenced by the two-line Asomtavruli inscription near the conch heel of the apse of the north gate: "Christ, have mercy on the soul of Bishop Giorgi, Amen." At the bottom of the inscription is written: "of Queen Mariam". The episcopal cathedral was helped by Queen Burdukhan, the mother of King Tamar: "Queen Burdukhan took care". During the invasions of Tamerlane, the church was badly damaged. According to the inscription on the western facade, the temple was rebuilt by King Alexander I (1411-1442). “May God praise the reign of the king Alexander the great who built this church, may God bless him and may his soul be blessed." The builder is mentioned in the inscription on the south facade of the church: "May God grant peace on Shalva the builder, Amen." In the 16th century, the church was rebuilt again by Mrovi Bishop Dionyse Laradze, and in the 17th century, it was renovated and decoraed by Queen Mariam, the wife of King Rostom (1632-1758). In the 18th century, the Mrovi bishop's congregation covered quite a large area. According to Vakhushti Bagrationi: "The bishop sits, the shepherd of this Ruisa Zeiti Kartli, to Likh-Tashiskari and shepherds the valley and Sadgeri...". Priest Nikoloz Orbeliani gives interesting information about the economy of the Diocese of Ruisi in his

"Congregation Register" compiled in 1715. 1803 Yustine Maghaladze built a pulpit in the temple. 1811 Diocese of Ruisi was abolished. The 1920 February earthquake severely damaged the monument, which was restored in 1936-38 by the Department of Monument Protection of the Department of Art Affairs of the Council of People's Commissars, and in 1950-1953 - a special restoration enterprise workshop.

It is located in the project distribution area, 0.94 and 0.99 km southwest of the nearest towers (T11 and T17).

Ruisi Church of St. Demetre.

Registration number: 8033.

District/municipality: Kareli.

Settlement: Ruisi.

Date: XIV-XVIII centuries.

GPS coordinates: 413297.00 m E, 4655452.00 m N - correct.

Initial Status:-

Current status: cultural heritage monument (30/03/2006, N3/133, Ministry of Culture, Monument Protection and Sports of Georgia).

Original Category:-

Current Category: Object/Monument Uncategorized.

Short description: The Church of St. Demetre is located 1 km northwest of the village, on a hill. It has a hall (6.3X10.3 m.), it is built with different sizes of sandstone, tufa is used occasionally. It has an entrance from the south. There is one window in the east, west and south walls. It is covered with tin. To the east is a semi-circular apse, separated by two-step shoulders. The conch rests on the vault over the shoulders. Longitudinal walls are separated with one pair of pilasters. The pilasters are two-tiered. The upper steps, crowned with capitals, have a vaulted arch, and the lower steps form a decorative arch of the longitudinal walls. There are similar half-pilasters in the edges of the western wall. In the eastern arch of the southern wall there is a preserved painting (Holy Riders?). The church has been greatly changed: cement has been used on the outside, and a 50 cm high concrete step is placed below the western and northern walls. The upper part of the interior is plastered and the lower part - cemented. The eastern arch of the northern wall is completely covered with cement.

It is located in the project distribution area, 0.62 km west of the nearest tower (T17). However, it should be noted here that the church is located in the village cemetery, from the extreme northern part of which the electricity line (cable) provided by the project, which will connect the different towers, should pass a few meters away (as far as we know, it should be buried in a trench with a width of approx. 0.4-0.5 m). In the above-mentioned location, earthworks must be carried out under the supervision of an archaeologist.

St. Marine Church.

Registration number: 10632.

District/municipality: Kareli.

Settlement: Ruisi.

GPS coordinates: 415356.66 m E, 4654365.48 m N - correct.

Date: Early Middle Ages.

Initial Status:-

Current Status: Object with no status.

Original Category:-

Current Category: Object/Monument Uncategorized.

Short description: St. The Marine Church is located in the center of the village, in the Zurabaant neighborhood, on the roadside, at the cemetery. The church has a hall (5.6X4.14 m.), it is built with hewn blocks of shirim stone, cobble stone and sandstone boulders. The arched entrance is to the west. There is one rectangular window on the axis of the apse with deep flattened, rounded corners. The hall had a single vault concreted with limestone. A single stone of the massive shelf cornice survives in the

northwest corner. The church was roofed with hewn stone tiles, which were later replaced with tiles. The church is heavily damaged: the vault and a large part of the conch are collapsed, the upper section of the southern wall is destroyed.

It is located in the project distribution area, 0.9 km southwest of the nearest towers (T05 and T07).

Kviratskhoveli Church.
Registration number: 21164.
District/municipality: Kareli.
Settlement: Ruisi.
GPS coordinates: 414693.13 m E, 4654890.23 m N - correct.
Date: XVIII-XIX centuries.
Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.

Brief description: The church is located in the north of the village, in the cemetery. It has a hall plan (7.43X4.47 m.), it is built with sandstone and cobblestone. The entrance is from the south. There is one window on the axis of the semicircular apse, one niche on both sides. The longitudinal walls of the hall are directly connected to the apse conch, the heels of which rest on the imposts. There is one window in the south wall. The church is covered with a two-tone tile roof.

It is located in the project distribution area, 0.6 km south of the nearest towers (T33 and T35).

Settlement.
Registration number: 21165.
District/municipality: Kareli.
Settlement: Ruisi.
GPS coordinates: 414316.00 m E, 4654965.00 m N - to be confirmed.
Date: Late Middle Ages.
First Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.

Brief description: The settlement is located 1 km north of the village, on the location Serebi. In the territory of the settlement, fragments of red-burnt, coarse-grained clay vessels and fragments of kvevri, the surface of which is plastered with lime, are confirmed. Remains of the foundations of several cobblestone buildings have been preserved.

According to the coordinates (which, as mentioned, need to be clarified), it is located in the project distribution area, at a distance of 0.45 and 0.63 km to the southeast of the nearest towers (T11 and T17).

Church of the Virgin Mary.
Registration number: 21166.
District/municipality: Kareli.
Settlement: Ruisi.
GPS coordinates: 414048.98 m E, 4654151.08 m N - correct.
Date: End of XIX – beginning of XX centuries.
Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.

Brief description: the church is located in the northeast of the village's anterior neighborhood. It dates back to the developed Middle Ages, and was renovated in the 19th-20th centuries. The church has a hall (8.35X5.8 m.), built of cobblestone and crushed stone. The facades are covered with well-polished shirimi stone blocks; here and there basalt blocks are also used. The entrance is from the south. On the axis of the semicircular apse is a rectangular window with deep niches on both sides. The west window is also rectangular, with a strongly curved lower part. The interior space is high. Initially, the interior walls were plastered. After the repair, they were polished again and whitened. At the same time, a four-pillared brick bell tower with semicircular arches on all four sides was built on the pediment hump of the western facade, which has a spherical vault on the inside, and is finished with a pyramidal roof on the outside. The church has preserved the old cornice of shirimi stone, which consists of a smooth shaft and a shallow circular pattern. It is covered with a two-tone tile roof.

It is located in the project spread area, 1.2 km south of the nearest towers (T11 and T17).

Ruisi St. David the Builder Church.

Registration number: does not have.
District/municipality: Kareli.
Settlement: Ruisi.
GPS coordinates: 414182.00 m E, 4654389.00 m N - correct.
Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.
Date: Late Middle Ages.
It is located in the project distribution area, 0.94 km south of the nearest tower (T11).

Urbnisi St. Stepane Cathedral (Urbnisi monastery complex).

Registration number: 7236.
District/municipality: Kareli.
Settlement: Urban.
GPS coordinates: 415510.25 m E, 4651484.94 m N - correct.
Date: boundary of V and VI centuries.
Initial Status:-
Current status: cultural heritage monument (30/03/2006, N3/133, Ministry of Culture, Monument Protection and Sports of Georgia).
Original Category:-
Current Category: National (07/11/2006, N665, President of Georgia).

Brief description: Zion of Urbnisi - the three-nave basilica is located in the village of Urbnisi, Kareli municipality. Based on the stylistic features and paleographical study of the Asomtavruli inscription on the northern facade, it dates to the boundary of the 5th and 6th centuries. In the mentioned inscription, the founders of the temple, named Constanti and Father Mikel, are mentioned. The other three inscriptions of different times talk about the restoration of the church. The Zion of Urbnisi is a basilica with three naves (32.1X22.4 m.), its plan, spatial solution and external masses bear clear signs characteristic of a basilica. In the interior and facades of the church, the original (boundary of the VI-VII centuries) and later (II half of the IX century and 1668) construction layers of repair and restoration are clearly visible. The earlier layers are built with well-smoothed blocks of sandstone. In the next period, stones of different shapes are used for reconstruction, the arrangement is irregular. There are three entrances to the temple: from the south, west and north. In the interior of the church, the naves are separated from each other by four cruciform pillars. The pillars and the semicircular brick arches resting on them divide the space of the middle nave into five, almost equal sections. The nave is covered with a brick semicircular vault. On the eastern facade of the temple, a cross is made of bricks. There is a similar cross on the west facade. In the western section of the north facade, under the window, there is a stone with the image of a cross, and further down is the image of a horse. The church has a serrated

brick cornice. The roof is tiled. The temple had an extension to the south and north, along its entire length. The southern extention, which ends in the east, is contemporaneous with the original building (later it was redone several times). The other parts of the extensions are later. Fragments of the church are embedded in them. The church also had an extension in the west - the remains of the walls have been revealed 2.5 m from the church. Urbnisi Zion belongs to the group of great basilicas of Georgia of the earlier feudal era (analogs - Katsreti Trinity, Khirsa).

It is located in the project spread area, 1.76 km southwest of the nearest towers (T09 and T17).

St. Nino's Church.

Registration number: none.
District/municipality: Kareli.
Settlement: Urbnisi.
Date: new and latest period (XX-XXI centuries).
GPS coordinates: 414882.18 m E, 4651706.08 m N - correct.
Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.

It is located in the modern-day cemetery of the village, in the southwestern part of the village, on the bank of Mtkvari River.

It is located in the project spread area, 2.35 km southwest of the nearest towers (T09 and T17).

Tower.

Registration number: 10604.
District/municipality: Kareli.
Settlement: Urbnisi.
Date: Middle Ages.
GPS coordinates: 415435.00 m E, 4651927.00 m N - to be confirmed.
Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.

According to the coordinates (which, as mentioned, need to be clarified), it is located in the project distribution area, 1.7 km southwest of the nearest towers (T09 and T17).

Old cemetery.

Registration number: 10619.
District/municipality: Kareli.
Settlement: Urbnisi.
GPS coordinates: 415708.00 m E, 4651506.00 m N - to be confirmed.
Date: Unknown.
Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.

Short description: Both Kaspi and Urbnisi are mentioned as ancient cities in "Moktsevai Kartlisai". "The upper stream of the river was divided into four towns... Sarkine City, Kaspi, Urbnisi and Odzrkhe"... In the life of St. Nino, Urbnisi is mentioned as a city. "Countless people from the city (of Urbnisi) go the big city to Mtskheta… for trade." Urbnisi is also known in history with the church meeting that took place in the villages of Ruisi and Urbnisi in 1103 during the time of David the Builder. It is written about this meeting in "Dzeglis Tsera": "The two bishops of Ruisi and Urbnisi gathered near Kartli region." Vakhushti Batonishvili says about Urbnisi: "And to the west of this mountain, on the edge of Mtkvari,

there is Urbnisi. Uplos, son of Kartlos, built the city up to "Krusad", and now there is a big church without a dome, there sits a bishop, the shepherd of the Great Liakhvi and which is watered by the Liakhvi River. King Vakhtang decorated the icon of St. Stepane the First Martyr and surrounded it with a wall. It is self-evident that the old cemetery of such a village is of scientific interest, and it is also connected to the fact that material monuments were found in the cemetery: a clay coffin, a jug, etc.

According to the coordinates (which, as mentioned, need to be clarified), it is located in the project distribution area, 1.6 km southwest of the nearest towers (T09 and T17).

Kvatskhela settlement.

Registration number: 20231.
District/municipality: Kareli.
Settlement: Urbnisi.
GPS coordinates: 417340.00 m E, 4651079.00 m N - correct.
Date: Bronze Age (IV-II millennium BC. Early Bronze Age - 3500-2500 BC).
Initial Status:-
Current Status: Object with no status.
Original Category:-
Current Category: Object/Monument Uncategorized.

Brief description: Kvatskhela settlement is located in Kareli district, on the left, high terrace of Mtkvari River, which is bordered from the east and west by small ditches, and from the south by the steep slope of the river. As a result of archaeological excavations, three cultural layers were found here. Upper layer belongs to the Early-Feudal Age, the lower two B and C contain three horizons each and represent the advanced and late stages of the Early Bronze Age. In layer C, the settlement C1 horizon is the best preserved, where parts of the building are preserved intact under a thick layer of rubble. Here, 25 buildings of the "standard" type characteristic of Shida Kartli were identified and excavated. 22 of them are with a spun clay frame, 3 are built with adobe bricks. In layer B, 15 buildings were excavated, which almost exactly replicate the building type of layer B. It seems that the planning of the settlement does not change during the entire existence of the Kvatskhela settlement. The houses are arranged in straight rows close to each other and are grouped around small squares and passages. Due to the slope of the territory, the settlement has a terraced appearance. The houses are rectangular, elongated, with rounded corners. The building, as a rule, consists of two parts - an almost square room and an entrance corridor separated from it by a wall, extending towards the facade. The room is residential, and the corridor had an economic purpose. The entrance to the room is in the center of the wall. Often there is a small elevation near the back wall of the room. In the center of the room there is a stationary round, fluted hearth; Behind it, in a pit made of cobblestones, stood a square pole which supported the roof. Houses were built on a pre-aligned horizontal square, without a special foundation. The walls were built either with adobe bricks in a single row, or with a spun clay frame; The floor was plastered with clay and well polished. Certain parts of the walls and floor and the edges of the elevation were painted red with ochre. Numerous clay vessels of different shapes and sizes, zoomorphic sculptures, sickle inserts, hand grinders, bone and stone tools and metal artifacts were found at the settlement.

It is located in the project distribution area, 0.9 km southwest of the nearest towers (T04 and T06).

Kvatskhela burial ground.

Registration number: 20232.
District/municipality: Kareli.
Settlement: Urbnisi.
GPS coordinates: 417369.00 m E, 4651080.00 m N - correct.
Date: Bronze Age (IV-II millennium BC. Early Bronze Age - 3500-2500 BC).
Initial Status:-
Current Status: Object with no status.

Original Category:-

Current Category: Object/Monument Uncategorized.

Short description: Kvatskhela settlment is one of the chrestomatous monuments of the Mtkvari-Araksi period studied in Shida Kartli. Two burial grounds have been studied on Kvatskhela, one of which is located directly on the territory of the settlement, on its northern part, and is tentatively known as the Kvatskhela burial ground, while the other burial ground was traced near Kvatskhela and is known as the "Tvlepia Tskaro" burial ground. Burial ground (Kvatskhela) excavated directly in the territory of the settlement consisted of two levels. The two pit burials studied here (N1 and N5) belong to the lower or first tier; The upper tier contained 13 graves, lined up on a northwest-southeast line. All the tombs studied at Kvatskhela belong to the group of pit tombs, they were located at different depths, almost all tombs (except for the two tombs of the lower tier and the N13 tomb of the upper tier) had roughly rectangular cobblestones, some of the tombstones were badly damaged. Burial pits were filled with stones, the pits were mostly rectangular, rarely oval, the dimensions of which varied from 0.9X0.8 m to 1.9X2.3 m in all cases. Specially selected flat cobblestones were arranged in orderly rows on the walls of one of the burial pits (N2). Another tomb had a floor paved with fine pebbles. Three tombs (NN7, 10, 15), unlike the others, must have had a wooden roof, and then the stone was laid. Except for two burials on the burial ground of Kvatskhela (N2 - two dead and N12 - three dead), all are individual. The posture of the dead is uniform: crouched on the left or right side. The inclination of the deceased is also the same, which is mainly oriented with the head towards the south. All fifteen tombs contained different items. Individual burials contained clay vessels of various sizes and shapes, spindle-weight, copper tools, jewelry, etc. Among them, some tombs are distinguished by their rich inventory (eg N2).

It is located in the project distribution area, 0.9 km southwest of the nearest towers (T04 and T06).

Burial ground of "Tvlepia Tskaro".

Registration number: 20233.

District/municipality: Kareli.

Settlement: Urbnisi.

GPS coordinates: 417566.00 m E, 4651292.00 m N - correct.

Date: Bronze Age (IV-II millennium BC. Early Bronze Age - 3500-2500 BC).

Initial Status:-

Current Status: Object with no status.

Original Category:-

Current Category: Object/Monument Uncategorized.

Brief description: Burial ground of the Tvlepia Tskaro is located two and a half kilometers from the village of Urbnisi to the east, on the left bank of Mtkvari River, on the old terrace of the river near the settlement of Kvatskhela, 200 meters north-east from it, at the head of Tvlepia Tskaro ravine. Four tombs have been studied at Tvelpia-Tskaro burial ground. One of the burials (N1) was a broken cobblestone bed (2 x 2 m. in size), mixed with ash, pottery shards, and a small amount of burnt human bones. The thickness of the barrow was 40-50 cm. Under it was a small clay square, in the middle of which, about 60-70 cm in diameter, traces of strong action of fire could be seen. The ground was visible under the field at a depth of 25-30 cm. Among the material found in the pile, noteworthy are the teeth of a child, burnt fragments of a barrel bone, metal slag, two copper "hoe-like" pendants and various types of beads, which also bore traces of fire. The said tomb is considered a cremation tomb. All the other three burials are inhumation and were pits dug into the ground, which were covered by a 20-30 cm thick square stone (the size of the stone varies between 2-2.5 X 2-2.7 m). The burials were oriented on a N-S line. The sides of one of the tombs (N3) were surrounded by cobblestones. The tombs were badly damaged and only fragments of the skeletons of the dead could be seen. In tomb N2, 3 dead people were must have been buried, and in N3, bone fragments were observed between the stones at different levels, so that neither its direction nor the number of dead people could be determined from them. Only fragments of a child's skull survived near the NE corner of the tomb. In tomb N4, the skeleton had almost disappeared, so it was not possible to determine the orientation of the tomb. All the tombs

of Tvelepias-Tskaro contained quite diverse inventory, the ceramic material is mainly presented in the form of fragments, there are a lot of copper hooks, beads and pendants, it is worth mentioning a copper spearhead, in addition, there are many beads of different shapes made of different types of stone.

It is located in the project distribution area, 0.6 km southwest of the nearest towers (T04 and T06).

Khizanaant Gora settlement.

Registration number: 20234.

District/municipality: Kareli.

Settlement: Urbnisi.

GPS coordinates: 415250.00 m E, 4651425.00 m N - to be confirmed.

Date: Antiquity (5th BC-3rd century BC); Middle Ages (IV-XVIII centuries); Bronze Age (IV-II millennium BC. Early Bronze Age (3500-2500 BC)).

Initial Status:-

Current Status: Object with no status.

Original Category:-

Current Category: Object/Monument Uncategorized.

Short description: Khizanaant Gora settlement is located in Kareli district, near Urbnisi village, on the left bank of Mtkvari river, on the ridge of the elevated terrace. It was created as a result of layering the settlements. The thickness of the cultural layer here exceeds 8 meters, the area is 340 square meters. meter. Here, under the feudal and ancient layers, 4 layers of the Early Bronze Age (B, C, D, E) were found. These layers are heavily damaged and do not give a clear picture of the planning. Two types of residential buildings have been confirmed on Khizanaant Gora: round (layers E, D) and quadrangular (layers C, B). The lower, E layer of Khizanaant Gora is represented by two horizons. One entire square, compacted with clay, must have been supported by small conical or two-tone gabled tholoses. In the center of the building, on the floor, a stationary hearth was plastered. This layer differs from the upper layers by the abundance of cultic and agricultural pits. A burial was cut into one of these pits. Round buildings are also found in the next layer D. The building of this time is a wittled room with a circular plan, with walls plastered with clay on both sides. The floor is plastered with ash, layered and painted red. The stationary hearth was also painted, behind which the central pole pit has been dug. Layers C and B contain three horizons each. More than 13 structures have been excavated in them. The construction technique is the same as in layer D. The buildings verified in these layers are very close to the buildings of Kvatskhela, which is especially clear on layer B of Khizanaant Gora. Some peculiarities are observed in layer C, especially in its early horizons, where the corners and even the walls of the building are somewhat rounded. The pit behind the hearth is not visible here. Various archaeological materials were found in all four layers of the settlement. Clay vessels of various shapes and sizes, hand grinders, sickle inserts, etc. are especially prevalent. It is worth noting the copper sickle found on the settlement.

According to the coordinates (which, as mentioned, need to be clarified), it is located in the project distribution area, 2.0 km southwest of the nearest towers (T09 and T17).

Early Bronze Age burial ground of Urbnisi.

Registration number: 20253.

District/municipality: Kareli.

Settlement: Urbnisi.

GPS coordinates: 415092.00 m E, 4651661.00 m N - to be confirmed.

Date: Bronze Age (IV-II millennium BC. Early Bronze Age - 3500-2500 BC).

Initial Status:-

Current Status: Object with no status.

Original Category:-

Current Category: Object/Monument Uncategorized.

Brief description: Early Bronze Age burials have been studied in Urbnisi. In total, nine tombs of this period have been identified in different areas of the settlement, seven of them are located in the western part of the settlement (N36 area), one - in the XX-2 area, and one burial was traced directly on Khizanaant Gora. All of them are individual pit burials, most of which were partially damaged by later period activities. Four of the seven pit burials (NN16, 17, 28, 29) studied in the western part of the settlement were so damaged that it was not possible to determine the full dimensions and inclination of the burial. The skeleton of the deceased was also fragmentary, so we cannot say anything about the burial posture. According to the relatively better preserved tombs (N5, N44 and N45), it is established that the dead were buried in specially dug pits, the contours of the tombs are not distinguished, so we cannot say anything about their dimensions. As for the depth (from the surface), it varies from 1 meter to 2 meters. In two cases (NN44, 45) the inclination is from north to south, with the head south, and one is from southwest to northeast, with the head SW. In all burials, one individual was buried, crouched, on his right side. All graves studied in this part of the settlement are inventoried. The pit burial excavated at the XX-2 site, which was partially damaged, was also inventoried. Cobblestones were arranged around and on top of the tomb. The deceased was lying on his right side, heavily curled up. The tomb was inclined in the N-S direction. As for the only pit burial discovered directly on Khizanaant Gora, which was damaged by a later pit, this burial was inclined on the S-N line. The deceased was lying on his right side, crouched. The inventory in the tomb was not confirmed. All the tombs studied in Urbnisi belong to the group of pit tombs, and most of them are inventoried. The inventory is represented by clay pots of various shapes and sizes and copper items. Clay vessels were present in all burials, while metal objects were confirmed only in two burials (N 44 and XX-2 studied at site).

According to the coordinates (which, as mentioned, need to be clarified), it is located in the project distribution area, at a distance of 2.15 km to the southwest of the nearest towers (T09 and T17).

Urbnisi Late Antiquity burial ground.

Registration number: 26574.

District/municipality: Kareli.

Settlement: Urbnisi.

GPS coordinates: 415537.00 m E, 4651408.00 m N - to be confirmed.

Date: Antiquity (5th BC-3rd century BC); Late Antiquity (Late Roman) - AD I-III centuries).

Initial Status:-

Current Status: Object with no status.

Original Category:-

Current Category: Object/Monument Uncategorized.

Brief description: the archaeological study of Urbnisi began in 1953. A total of 280 tombs were excavated in the burial ground, most of which date back to the Late Antiquity. There were also Late Bronze and Hellenistic age tombs. The tombs of the Late Antiquity period are pit tombs. The dead were buried on their backs, often in a supine sprawling position. The tombs contain numerous inventories - ceramics, glassware, jewelry and coins.

According to the coordinates (which, as mentioned, need to be specified), it is located in the project distribution area, 1.8 km southwest of the nearest towers (T09 and T17).

- ***Possible impact of planned works in the project area on material cultural heritage objects***

The entire area was searched and carefully inspected. As far as possible, the placement points of the turbines (the same towers) in the area defined by Point1, Point2, Point3 and Point4 were checked with their circular areas. Sections of roads and power lines (cables) included in the project were inspected by car and, to a large extent, on foot. In some, not rare cases, specific areas were enclosed by iron and wire fences, which could not be viewed from the inside, however, due to their location on the open terrain, they were also more or less explored.

Directly in the project area, except for a few places, there are no remains of any object and/or artefact with the mark of cultural heritage anywhere. However, due to the number of important archeological-architectural monuments and objects cited above from the scientific literature, which are abundantly recorded and largely studied in the area under consideration by the project, we consider it appropriate to have the supervision of an archaeologist during the earthworks.

As a result of the review of the project area, several noteworthy places were selected, where the supervision of an archaeologist and/or the production of archaeological works will be necessary before the start of earthworks. these are:

✓**Mound**/registration number: 21227/ (GPS coordinates: 410408.00 m E, 4659177.00 m N - to be confirmed) of Korgani /registration number: 21227/ (GPS coordinates: 410408.00 m E, 4659177.00 m N - to be specified) the electricity transmission line (cable) provided for by the project, which will connect the different masts, should go within 200 meters from the possible location. In the above-mentioned location, earthworks must be carried out under the supervision of an archaeologist.

✓**St. Demetre Church of Ruisi** (GPS coordinates: 413297.00 m E, 4655452.00 m N - correct) is located in the **village cemetery**, a few meters from the extreme northern section of which the electricity transmission wire (cable) provided by the project, which will connect the different towers, should pass. In the above-mentioned location, earthworks must be carried out under the supervision of an archaeologist.

✓**Archaeologically sensitive site, tentatively, "Ceramics1".** GPS coordinates of the site: 416353.98 m E, 4654187.04 m N. The area of interest is located 90 meters south-west of the T18 turbine (mast), 16 meters south of the turbine arc (estimated work area). Fragments of ceramics from the late Middle Ages are collected at the site. The planned earthworks in the area must be preceded by the inspection of the adjacent section by means of test trenches (shurfs), the size and number of which will be decided on the spot.

✓**Probable archaeological site, tentatively "Cross 1".** GPS coordinates of the place: 416104.35 m E, 4654467.61 m N. An iron cross (height 1.65 m) is placed right next to the road in one section of the road passing through agricultural land. The above-mentioned section is 0.26 and 0.3 km away from turbines T05 and T07, respectively, however, earthworks (if planned) must be carried out under the supervision of an archaeologist.

✓**Probable archaeological site, tentatively, "Cross 2".** GPS coordinates of the site: 417728.10 m E, 4655682.41 m N. The area of interest is located 115 meters north-west of the T20 turbine (mast), 39 meters north-west of the turbine arc (estimated work spread area). An iron cross (height 2.0-2.2 m) has been erected on the site, at the bottom of which is placed a marble stone with the inscription: “”Sulia”, Suliko Kopadze, 1972-2002.” Earthworks on the site (in case of such planning) must be agreed with the local population and conducted under the supervision of an archaeologist.

✓ **Archaeologically sensitive place, conditionally "inhabited".**

GPS coordinates of the place: 435349.39 m E, 42558.65 m N. The area of interest is located in the northwestern corner of the project area, on the left bank of the East Prone River, 150 meters away from it. Directly includes T22, T24 turbines and its surrounding area. about 16 m. high hill is spread on a north-south axis. The hill dominates the environment. Its western part is bordered by the river, the southern part is flat, the eastern side is surrounded by a narrow gorge, and the northern side is bordered by a wide range. Its southern slope is completely, and the western and eastern slopes are partially, probably in the last century, artificially terraced, on which a cover of coniferous trees is planted. In the center of the hill and on its southern slope, small rectangular depressions can be observed, which were probably also used as military trenches in the last century. Due to the mechanical interventions in the area, traces of buildings and structures are not visible on the surface, although stones of various sizes scattered here may have been used for construction purposes in the historical period.

As a result of conducted field reconnaissance, archaeological ceramic products are collected on the entire perimeter of the hill. Among the excavated materials, physical entities are represented in the form of a kvevri base, a jug ear, a pot rim, and a bread oven fragment. According to preliminary information, the artifacts should belong to the Middle Ages. The area of distribution of artefacts decreases about 70 meters north of turbine T22, T24, and gradually stops, however, it is not excluded that the

archaeological layers also extend in the direction of turbine T42, on the ridge north of the hill. Accordingly, construction activities in the mentioned sections must be carried out under archaeological supervision. Accordingly, the earthworks planned in the area must be preceded by the inspection of the adjacent section by means of test trenches (shurfs), the size and number of which will be decided on the spot.

✓**Paniashvili family obelisk.** GPS coordinates of the site: 435951.32 m E, 42124.49 m N. It is located in the southeast corner of the study area. From the north side of the Tbilisi-Senaki-Leselidze freeway, in the central section of the project road leading to T09 and T06 turbines, on the left bank of the irrigation channel. The obelisk is a modern, red brick stele, on which the inscription on the granite stone informs us that "ninety-five representatives of the Paniashvili clan innocently killed by the Bolsheviks in 1924 rest in this area."

In the case of planning earthworks in the mentioned area, the process must be agreed with the local population and conducted under the supervision of an archaeologist.

✓**Probable archeological site, tentatively, "arc-shaped quarry".** GPS coordinates of the place: 435858.15 m. E, 42327.55 m. N, is located in the central-eastern part of the study area. Near the central section of the wire (cable) running from turbine T04 T25 northwest to turbine T16 T19, 30 meters north of it. It is an arc-shaped stone whose diameter does not exceed 2 meters. It is composed of fine and small stones. The outer edge of the edge is irregular in shape, while the inner side is smooth. It is true that the archaeological materials in the vicinity of the structure are not confirmed, but the dump is of an unspecified period, cultural origin. Accordingly, earthworks in the mentioned area must be carried out under archaeological supervision. For this, the earthworks planned in the area must be preceded by the inspection of the adjacent section by means of test trenches (shurfs), the size and number of which will be decided on the spot.

✓**Probable archaeological site, tentatively, "small quarry".** GPS coordinates of the place: 417450.45 m E, 4655531.41 m N. It is located in the central-eastern part of the study area. T18, T20 0.32 km west of the turbine, on the cable leading to the turbine. It represents today a shapeless, piled-up stone site. A little remaining arrangement of stones (?) and slight indentations can be observed here and there, with approx. 1.5-2 sq/m. Accordingly, earthworks in the mentioned area must be carried out under archaeological supervision. For this, the earthworks planned in the area must be preceded by the inspection of the adjacent section by means of test trenches (shurfs), the size and number of which will be decided on the spot.

❖ ***Recommendations and mitigating measures***

In the event that cultural heritage is discovered in the entire section of the project area during the earthworks, according to Article 10 of the Law of Georgia "On Cultural Heritage", the works must be stopped immediately and the Ministry of Culture, Sports and Youth of Georgia (at this stage - National Agency of Cultural Heritage Protection of Georgia) should be notified about this.

Archaeologist: David Darejanashvili

Tbilisi
2022

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Annex 1, tables

Table 1. The defining points of the project territory

N	Title	E coordinate	N coordinate
1	Point 1	408258.00 m E	4652498.00 m N
2	Point 2	408543.00 m E	4662506.00 m N
3	Point 3	418087.00 m E	4650817.00 m N
4	Point 4	418125.00 m E	4662196.00 m N

Table 2. The coordinates of the points marked in yellow (masts)

N	Title	E coordinate	N coordinate
1	T 04	418092.00 m E	4651798.00 m N
2	T 01	418012.00 m E	4652230.00 m N
3	T 09	417201.00 m E	4652097.00 m N
4	T 06	417568.00 m E	4652920.00 m N
5	T 05	416566.00 m E	4653746.00 m N

6	T18	416438.00 m E	4654221.00 m N
7	T 07	416168.00 m E	4654777.00 m N
8	T 08	416673.00 m E	4655645.00 m N
9	T 20	417767.00 m E	4655574.00 m N
10	T 12	418071.00 m E	4656033.00 m N
11	T 23	417173.00 m E	4656100.00 m N
12	T 02	416334.00 m E	4656201.00 m N
13	T 03	415967.00 m E	4655857.00 m N
14	T 25	415833.00 m E	4656535.00 m N
15	T 16	415834.00 m E	4656953.00 m N
16	T 27	416728.00 m E	4658801.00 m N
17	T 34	414740.00 m E	4659029.00 m N
18	T 58	414880.00 m E	4659411.00 m N
19	T 46	415632.00 m E	4659731.00 m N
20	T 55	416370.00 m E	4660118.00 m N
21	T 48	416934.00 m E	4659587.00 m N
22	T 33	417655.00 m E	4659120.00 m N
23	T 29	418031.00 m E	4659687.00 m N
24	T 37	416498.00 m E	4660737.00 m N
25	T 52	416218.00 m E	4661384.00 m N
26	T 30	417376.00 m E	4661200.00 m N
27	T 56	418064.00 m E	4661520.00 m N
28	T 21	417269.00 m E	4661782.00 m N
29	T 13	417945.00 m E	4662101.00 m N
30	T 28	416150.00 m E	4662093.00 m N
31	T 54	413666.00 m E	4657350.00 m N
32	T 44	413149.00 m E	4656799.00 m N
33	T 38	412583.00 m E	4657145.00 m N
34	T 19	412449.00 m E	4656513.00 m N
35	T 14	412506.00 m E	4655997.00 m N
36	T 17	413919.00 m E	4655453.00 m N
37	T 35	414831.00 m E	4655492.00 m N
38	T 57	408303.00 m E	4654938.00 m N
39	T 10	408435.00 m E	4655424.00 m N
40	T 15	408548.00 m E	4655905.00 m N
41	T 26	408968.00 m E	4656812.00 m N
42	T 32	409203.00 m E	4657357.00 m N
43	T 36	409701.00 m E	4657994.00 m N
44	T 11	410041.00 m E	4660165.00 m N
45	T 24	409948.00 m E	4660801.00 m N
46	T 41	410957.00 m E	4661103.00 m N
47	T 53	409912.00 m E	4661326.00 m N
48	T49	410065.00 m E	4661823.00 m N
49	T42	409067.00 m E	4662061.00 m N
50	T22	408788.00 m E	4661538.00 m N

Table 3. The coordinates of the points marked in red (masts?)

N	Title	E coordinate	N coordinate
1	T 06	418013.00 m E	4651707.00 m N
2	T 02	418085.00 m E	4652126.00 m N
3	T 17	417201.00 m E	4652097.00 m N
4	T 09	417568.00 m E	4652920.00 m N
5	T 07	416787.00 m E	4653517.00 m N
6	T 15	416458.00 m E	4654118.00 m N
7	T 05	416235.00 m E	4654695.00 m N
8	T 11	414067.00 m E	4655324.00 m N

9	T 33	414831.00 m E	4655492.00 m N
10	T 03	415941.00 m E	4655779.00 m N
11	T 10	416761.00 m E	4655570.00 m N
12	T 18	417783.00 m E	4655561.00 m N
13	T 08	418096.00 m E	4656038.00 m N
14	T 12	417205.00 m E	4656123.00 m N
15	T 01	416362.00 m E	4656165.00 m N
16	T 04	415833.00 m E	4656535.00 m N
17	T 19	415799.00 m E	4657018.00 m N
18	T 14	412445.00 m E	4655973.00 m N
19	T 16	412449.00 m E	4656513.00 m N
20	T 45	413149.00 m E	4656799.00 m N
21	T 30	412557.00 m E	4657113.00 m N
22	T 41	413666.00 m E	4657350.00 m N
23	T 46	414699.00 m E	4658932.00 m N
24	T43	414889.00 m E	4659361.00 m N
25	T 32	417016.00 m E	4658726.00 m N
26	T 31	417038.00 m E	4659205.00 m N
27	T 26	417027.00 m E	4659671.00 m N
28	T 47	413962.00 m E	4661398.00 m N
29	T 35	414129.00 m E	4661859.00 m N
30	T 27	414338.00 m E	4662288.00 m N
31	T 38	412532.00 m E	4661391.00 m N
32	T 40	412723.00 m E	4661825.00 m N
33	T 39	412897.00 m E	4662256.00 m N
34	T 25	408494.00 m E	4654948.00 m N
35	T 21	408631.00 m E	4655374.00 m N
36	T 22	408728.00 m E	4655825.00 m N
37	T 37	409073.00 m E	4656847.00 m N
38	T 44	409209.00 m E	4657350.00 m N
39	T 49	409523.00 m E	4657755.00 m N
40	T 13	410045.00 m E	4660163.00 m N
41	T 23	409948.00 m E	4660801.00 m N
42	T 34	409912.00 m E	4661326.00 m N
43	T 36	410065.00 m E	4661823.00 m N
44	T 24	408788.00 m E	4661538.00 m N
45	T 42	409096.00 m E	4661998.00 m N

Table 4. Monuments/objects protected in the Agency's database

N	Title	E coordinate	N coordinate	Coordinate accuracy
1	Church of the Virgin Mary	408291.00 m E	4652667.00 m N	to be specified
2	Berikldeebi settlement and burial ground	409756.00 m E	4652916.00 m N	to be specified
3	Salariani Church and settlement	408504.00 m E	4656787.00 m N	to be specified
4	Settlement	411559.00 m E	4657786.00 m N	to be specified
5	Settlement	409260.00 m E,	4659521.00 m N	to be specified
6	A. Proneli's (Kipshidze) house	409269.00 m E	4657195.00 m N	correct
7	Tsveri Complex	408549.00 m E	4659181.00 m N	correct
8	Church Complex – Dedoplis Mindori	404922.00 m E 405081.00 m E	4659417.00 m N 4658773.00 m N	to be specified correct

10	Tower-column	409267.00 m E	4659528.00 m N	to be specified
11	Mound	410408.00 m E	4659177.00 m N	to be specified
12	Church of the Virgin Mary	414851.86 m E	4660558.86 m N	correct
13	St. George Church	414233.00 m E	4659872.00 m N	correct
14	Ruins of a tower	Not provided		
15	Mound Goraka	Not provided		
16	Burial ground	415461.00 m E	4660409.00 m N	to be specified
17	Tomb	414306.00 m E	4659876.00 m N	to be specified
18	Khatinatkhi Mound	415710.00 m E	4660818.00 m N	to be specified
19	Cylindric tower	417373.82 m E	4658639.71 m N	correct
20	Settlement	417497.00 m E	4658444.00 m N	to be specified
21	St. George	413283.00 m E	4658087.00 m N	correct
22	Church of the Virgin Mary	414797.00 m E	4654187.00 m N	correct
23	Kviriketsminda Church	415888.00 m E	4653996.00 m N	correct
24	Ruisi Virgin Mary Church Complex	413685.00 m E	4654488.00 m N	correct
25	Ruisi St. Demetre Church	413297.00 m E	4655452.00 m N	correct
26	St. Marine Church	415356.66 m E	4654365.48 m N	correct
27	Kviratskhoveli Church	414693.13 m E	4654890.23 m N	correct
28	Settlement	414316.00 m E	4654965.00 m N	to be specified
29	Church of the Virgin Mary	414048.98 m E	4654151.08 m N	correct
30	Ruisi St. David the Builder Church	414182.00 m E	4654389.00 m N	correct
31	Urbnisi St. Stepane Cathedral	415510.25 m E	4651484.94 m N	correct
32	St. Nino Church	414882.18 m E	4651706.08 m N	correct
33	Tower	415435.00 m E	4651927.00 m N	to be specified
34	Old cemetary	415708.00 m E	4651506.00 m N	to be specified
35	Kvatskhela settlement	417340.00 m E	4651079.00 m N	correct
36	Kvatskhela burial ground	417369.00 m E	4651080.00 m N	correct
37	“Tvlepia Tskaro” burial ground	417566.00 m E	4651292.00 m N	correct
38	Khizanaant Gora settlement	415250.00 m E	4651425.00 m N	to be specified
39	Urbnisi Early Bronze burial ground	415092.00 m E	4651661.00 m N	to be specified
40	Urbnisi Late Antiquity burial ground	415537.00 m E	4651408.00 m N	to be specified

Table 5. <u>Archaeologically noteworthy sections</u>

N	Title	E coordinate	N coordinate
1	Mound	410408.00 m E	4659177.00 m N
2	Ruisi St. Demetre Church	413297.00 m E	4655452.00 m N
3	„Ceramics1“	416353.98 m E	4654187.04 m N

4	„Cross 1“	416104.35 m E	4654467.61 m N
5	„Cross 2“	417728.10 m E	4655682.41 m N
6	„Settlement“	408799.00 m E	4661364.00 m N
7	Paniashvili family obelisc	416974.00 m E	4652794.00 m N
8	Stone mound in the shape of an arc”	415835.00 m E	4656676.00 m N
9	“Small stone mound”	417450.45 m E	4655531.41 m N

Table 6. Local, national and international intangible cultural heritage

There are 65 objects with the status of intangible cultural heritage in the territory of Georgia. Accordingly, as a result of the research of background information and in case of communication with the population of the villages listed above in Kareli and Gori municipalities, it is not excluded that a number of monuments of intangible cultural heritage will be confirmed in the research area.

List of intangible cultural heritage sites (2021 data):

N	Title	Date of registration	Category	Note
1	Georgian polyphony	17.11.2011	National	In 2001, it was included in the UNESCO list of intangible cultural heritage.
2	Kvevri	17.11.2011	National	Technology of making kvevri
3	Ancient Georgian traditional method of making Kvevari wine	27.03.2012	National	On December 4, 2013, it was included in the UNESCO list of intangible cultural heritage.
4	“Dedaena” (mother tongue) (Yakob Gogebashvili's method of compiling the Georgian alphabet manual)	25.03.2013	National	
5	Berikaoba	25.03.2013		
6	Kalakuri Mravalzhamieri	25.03.2013		
7	Chidaoba (Georgian wrestling)	25.09.2014		On November 29, 2018, it was included in the UNESCO list of intangible cultural heritage.
8	"The Living Culture of Three Ancient Types of the Georgian Alphabet"	20.03.2015	National	On November 30, 2016, it was included in the UNESCO list of intangible cultural heritage.
9	Tradition of oral knowledge of "Vepkhistkaosani" (“The Knight in the Panther’s Skin.”)	7.10.2015		
10	The tradition of wood carving – ornament in Svan traditional living and household items	15.10.2015		
11	Bazieroba” (hunting with a bird of prey)	27.10.2016		
12	Georgian traditional table culture (Georgian Supra (feast))	29.03.2017	National	

13	Georgian folk medical knowledge and traditions of its use	23.08.2017		
14	Georgian-Jewish tradition of 26 centuries of unique relationship	13.04.2018		
15	Georgian silk	12.06.2018		
16	"Ksnuri Ulami" - a tradition of gratuitous labor mutual aid	10.08.2018		
17	Georgian folk equestrian games - isindi, tskhenburti (horseball), kabakhi, marula	31.08.2018		
18	Georgian wheat culture (endemic species and local varieties)	7.09.2018		
19	The tradition of bagpiping in Georgia	3.10.2019		
20	The tradition of musical education of children in the "Decade of Talents"	2.03.2020		
21	The tradition of wearing Chokha-Akhalukhi, the symbol of Georgian identity	9.06.2020		
22	The tradition of preparation and consumption of Georgian “matsoni” (yoghurt)	22.07.2020		
23	Dance “Kartuli	19.09.2020		
24	Georgian tradition of making kvevri	6.04.2021		
25	Tradition of making “doki” (wine jug)	29.04.2021		

Appendix 2, maps

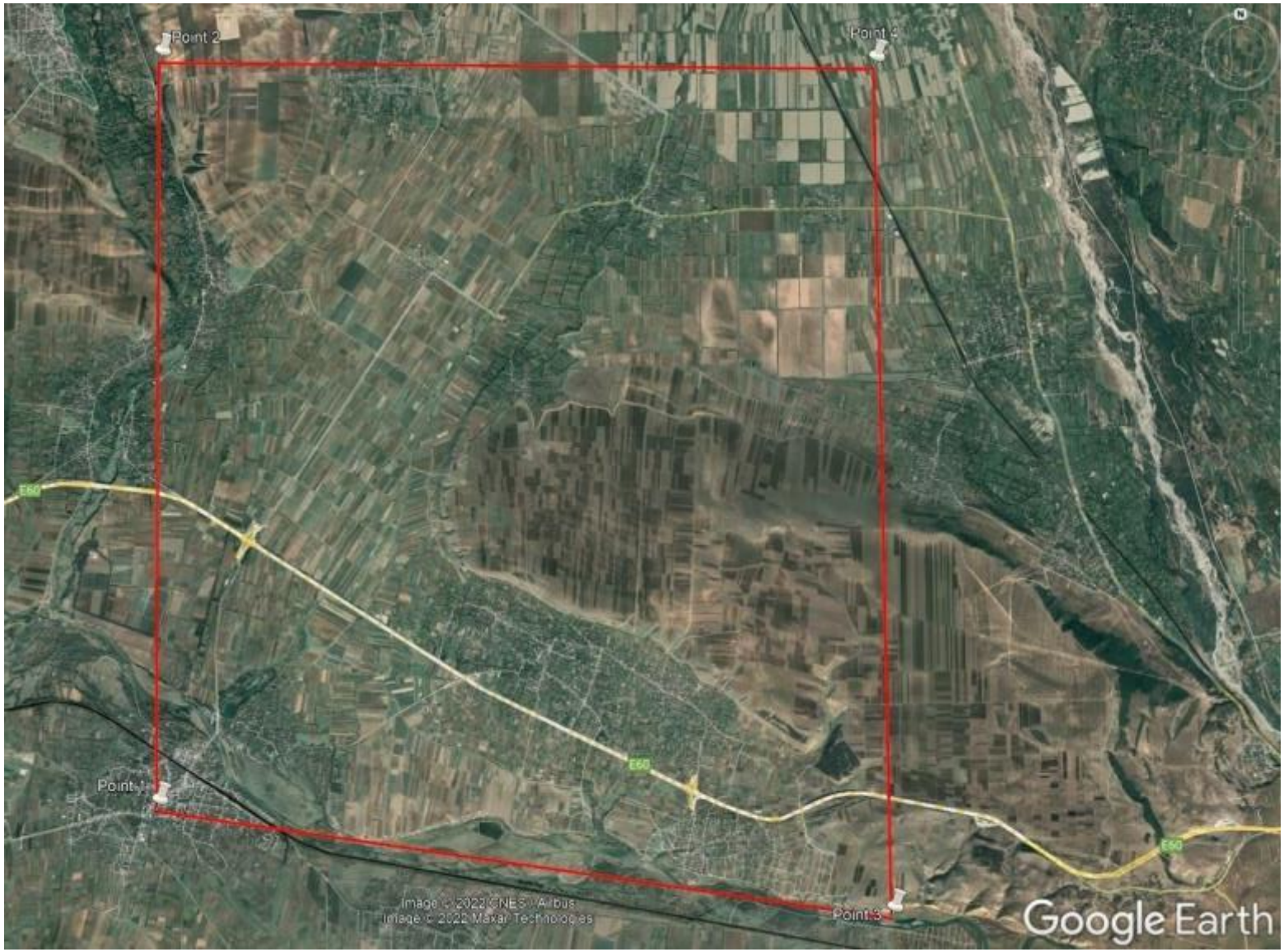


Fig. 1. Project area (red rectangle). Orthophoto

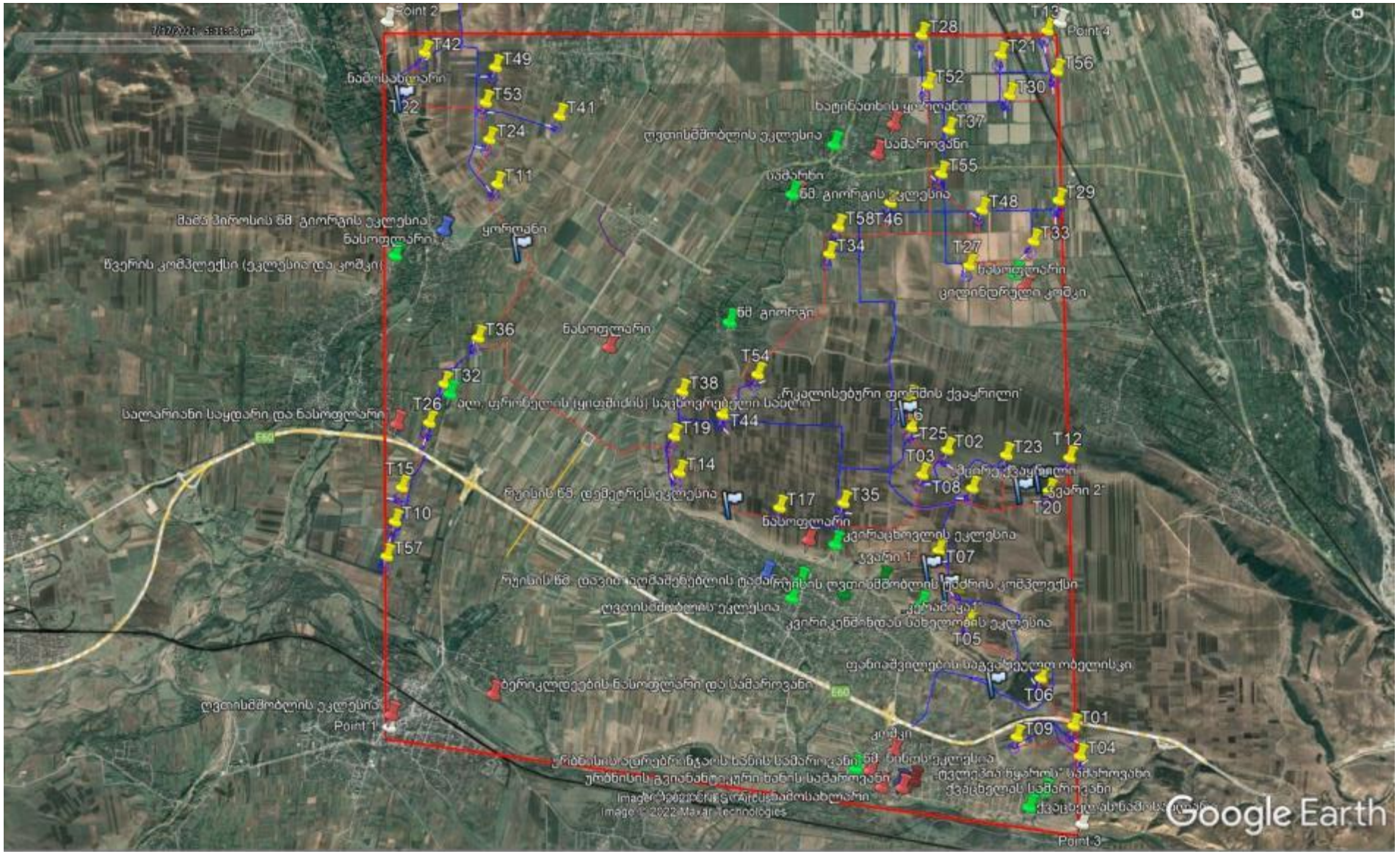


Fig. 2. Protected monuments/objects (green, red and blue marks), towers (yellow marks), access roads to them (blue lines), power lines (red lines) and archaeologicall interesting areas (flag-marks) in the project area in the database of the Agency (base). Orthophoto

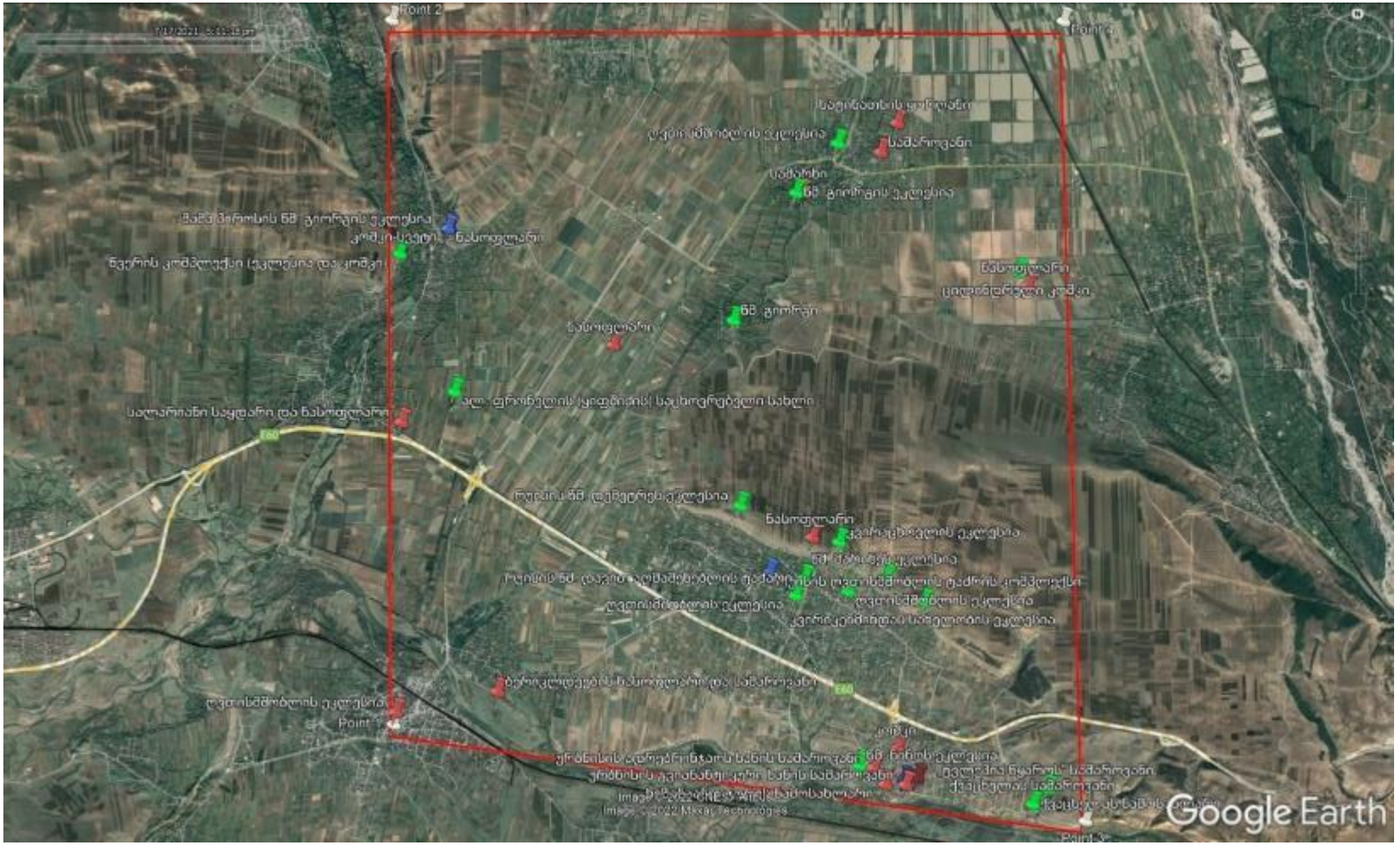


Fig. 3. Monuments/objects (green, red and blue marks) protected in the Agency's database (base) in the project area. Orthophoto

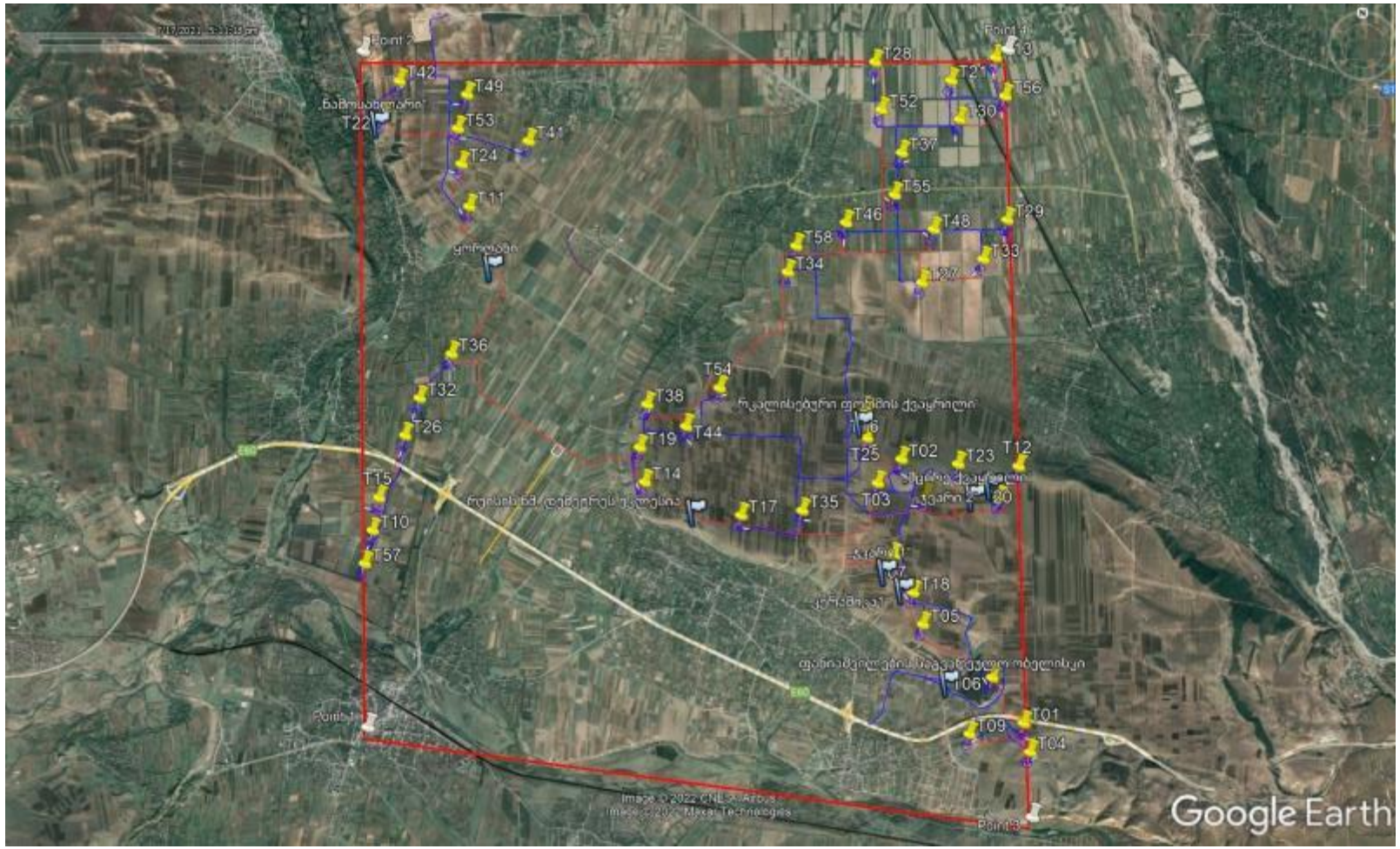


Fig. 4. Masts (yellow marks), access roads to them (blue lines) and power lines (red lines) in the project area. Orthophoto

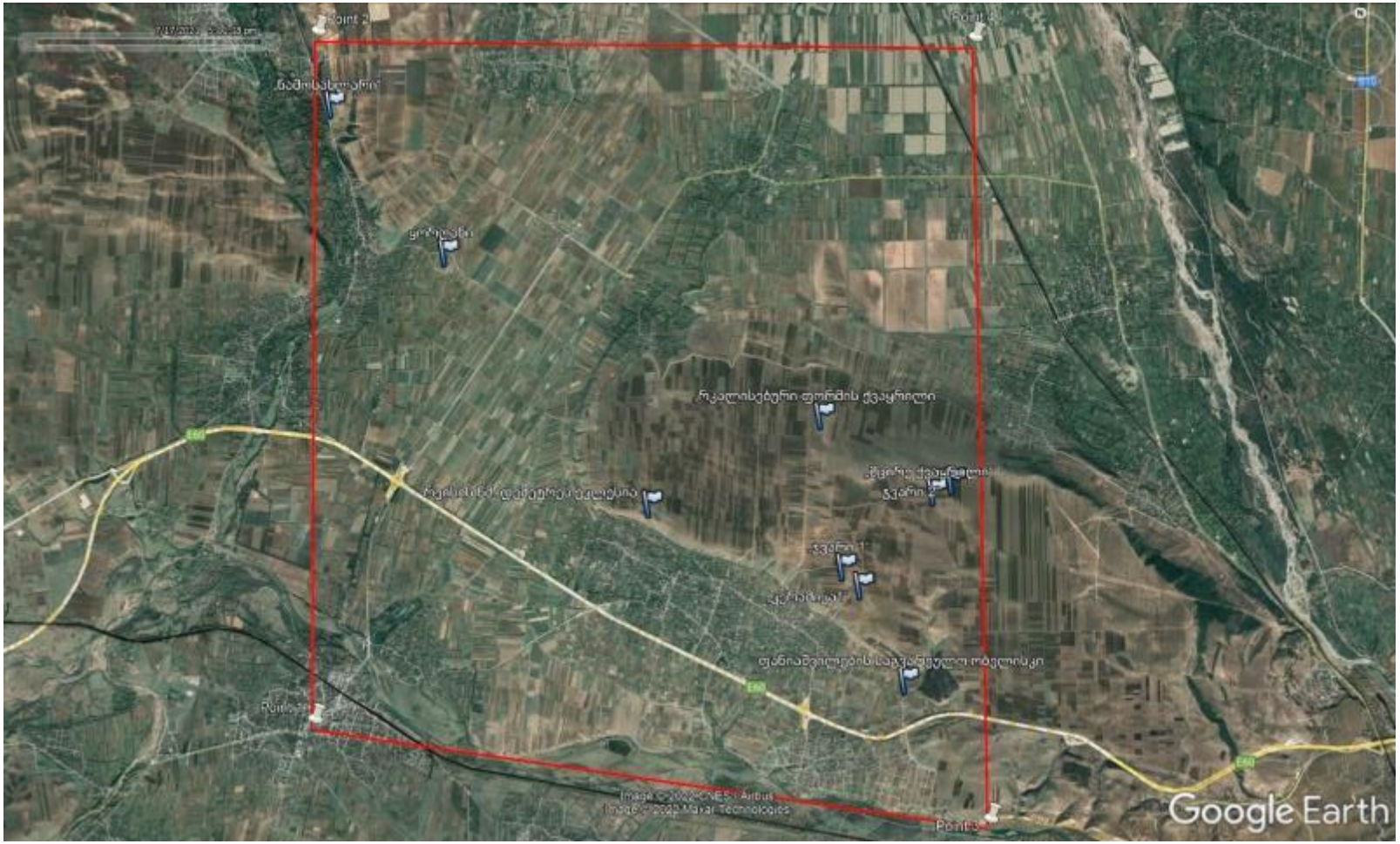


Fig. 5. Archaeologically noteworthy areas (flags) on the project territory. Orthophoto

Fig. 6. "Settlement" (flag-mark) in relation to the T22 mast (yellow mark). Orthophoto

Fig. 7. "Mound" (flag-mark) in relation to the power line (red line). Orthophoto

Fig. 8. St. Demetre Church (flag-mark) and cemetery in relation to the power line (red line). Orthophoto

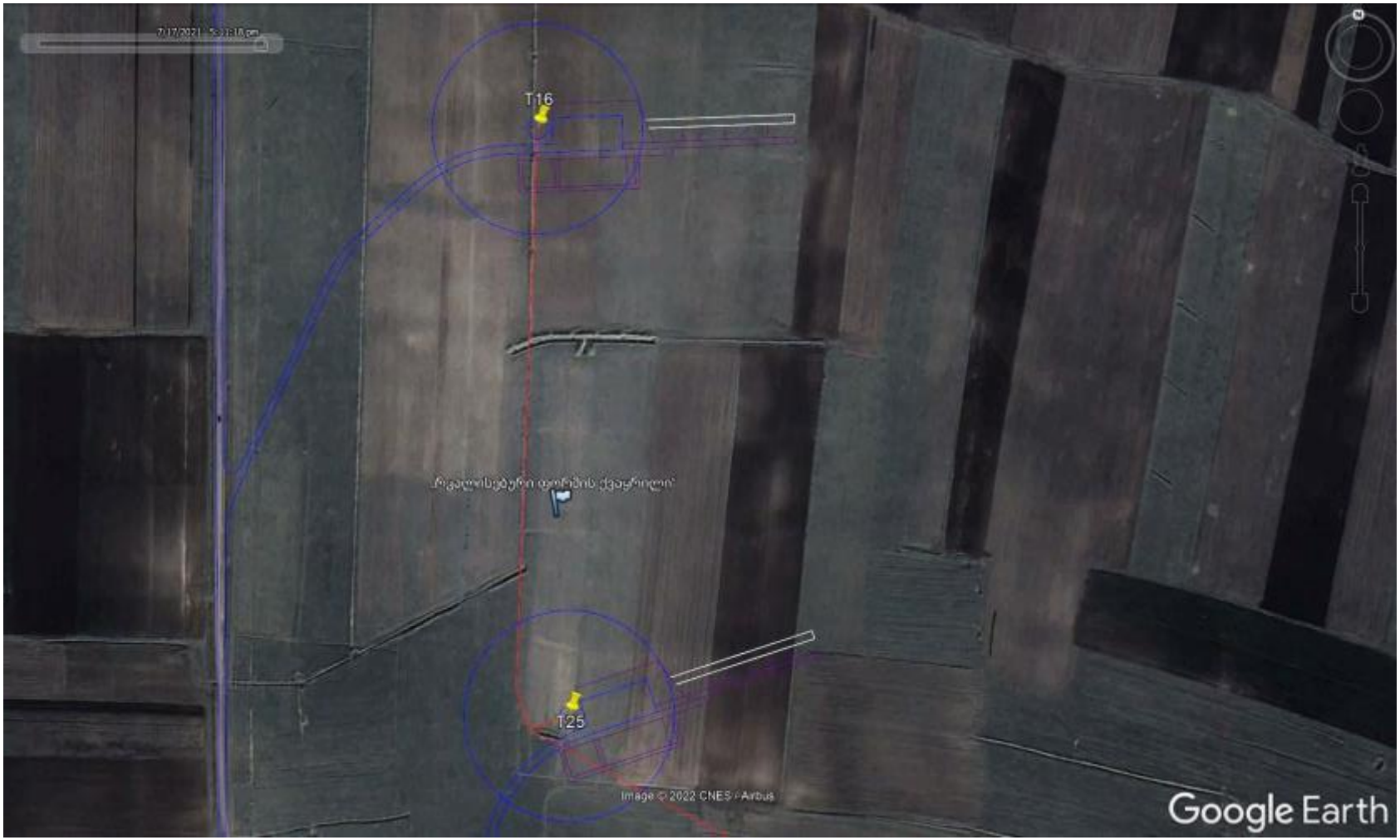


Fig. 9. "Arc shaped mound" (flag) in relation to T16 and T25 masts (yellow marks). Orthophoto

Fig. 10. "Small mound" and "Cross2" (flag-signs) in relation to the T20 mast. Orthophoto

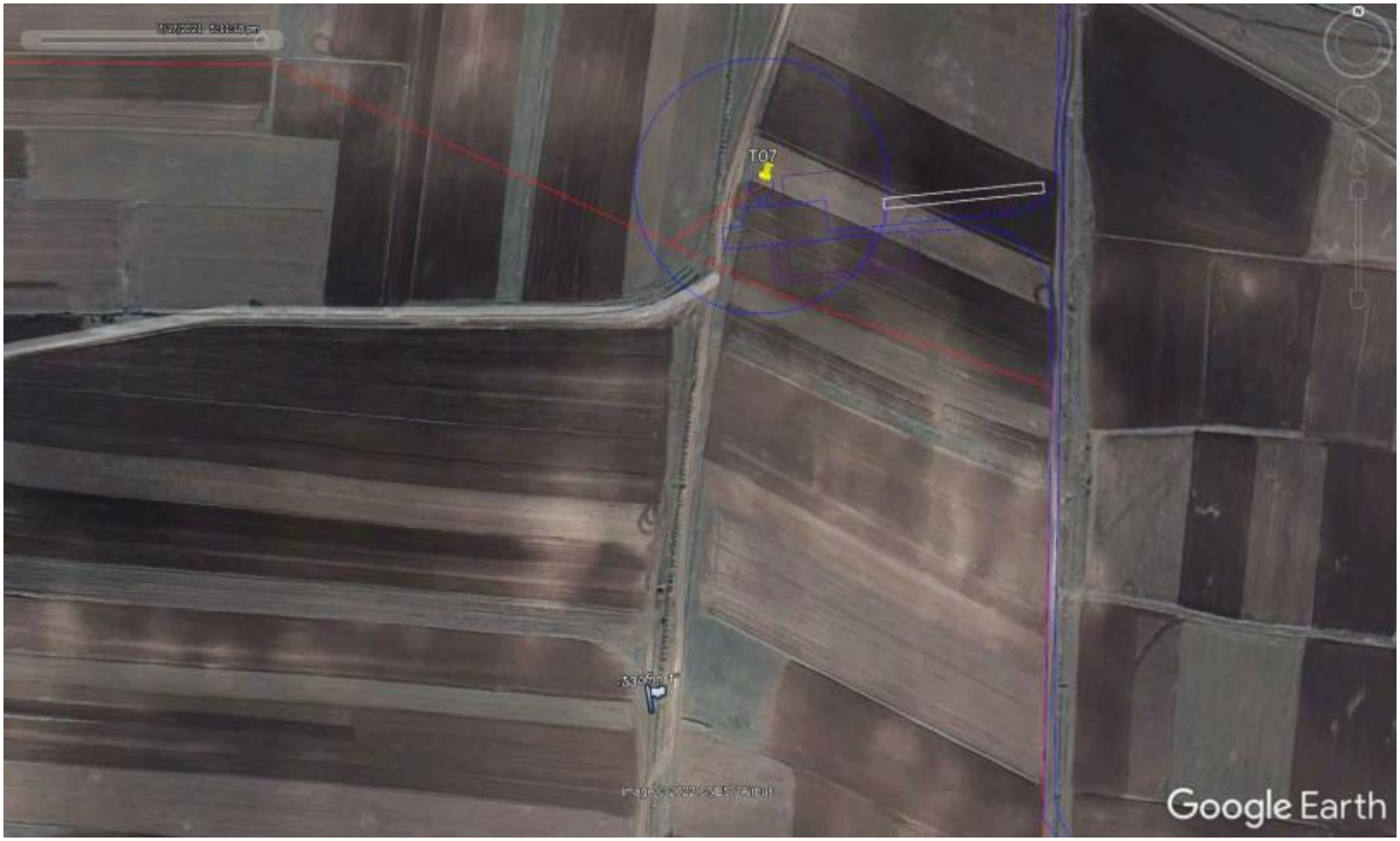


Fig. 11. "Cross 1" (flag-sign) in relation to mast T07. Orthophoto

Fig. 12. "Ceramics1" (flag-mark) in relation to the T18 mast (yellow mark). Orthophoto

Fig. 31.

Paniashvili family obelisk (flag-sign) in relation to T06 mast (yellow sign). Orthophoto

Appendix 3, photomaterials

Tsveri Complex (church and tower)

Father Piros Church, St. George Church and bell tower

Sakasheti Virgin Mary Church

Sakasheti St. George Church

Sakasheti tower ruins

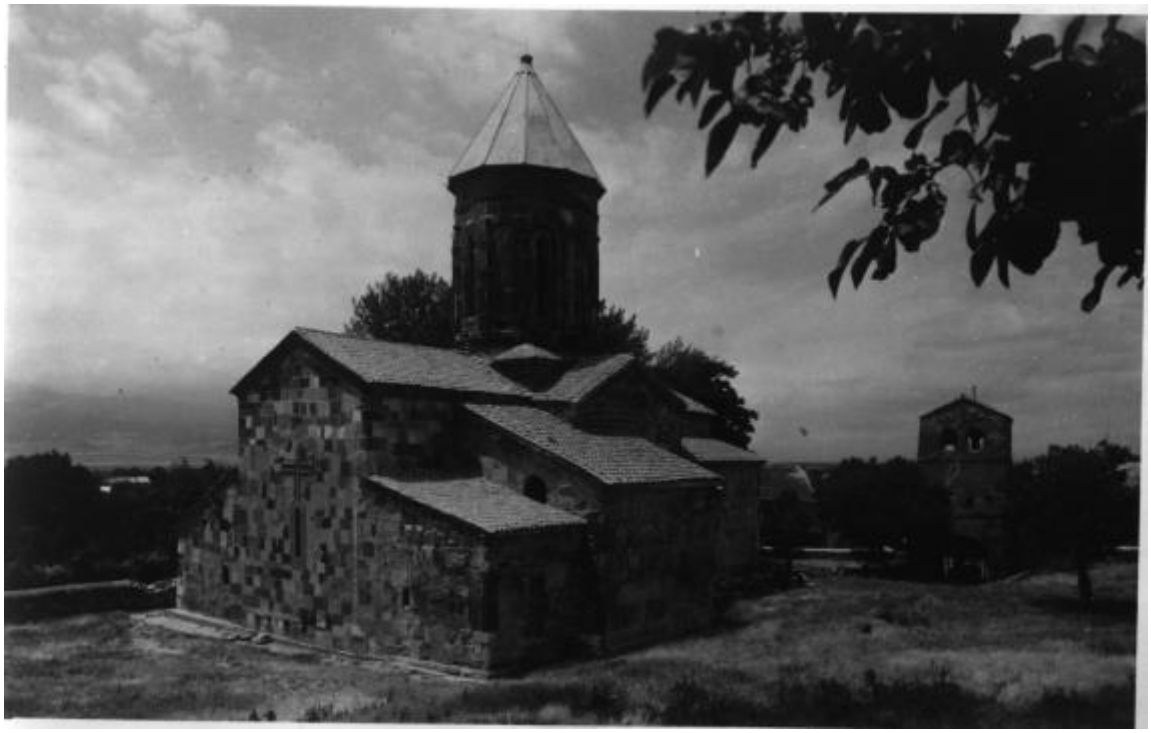
Sakasheti. Mound Goraka

Variani cylindrical tower

Sasireti's St. George

Ruisi Virgin Mary Church

Ruisi Kviriketsminda Church



Ruisi Virgin Mary Church Complex

Ruisi St. Demetre Church

Ruisi St. Marine Church

Urbnisi St. Stepane Cathedral (Urbnisi Monastic Complex)

Dedoplis Gora (Aradeti Orgora). Photo from the Internet

Dedoplis Mindori. Photo from the Internet

Uplistsikhe. Photo from the Internet

Gori Fortress. Photo from the Internet

Annex 12. Waste Management Plan

Waste management Plan

1. Introduction

The given document presents the Waste Management Plan for wastes generated during the construction and operation of the Ruisi Wind Power Plant of JSC Wind Power.

The Waste Management Plan (WMP) has been prepared to meet the requirements of Georgian law "Waste Management Code". According to Article 14, Clause 1 of the Code, "Natural persons or legal persons who annually produce more than 200 tonnes of non-hazardous waste or more than 1000 tonnes of inert waste or more than 120 kg of hazardous waste[10], shall prepare a company waste management plan."

The WMP will be updated every 3 years, or whenever types, volumes and treatment methods of generated wastes would notably change.

As far as it is anticipated that the planned activities will generate both non-hazardous waste and hazardous waste (more than 120 kg annually), the Waste Management Plan for the construction and operation phases of the wind power plant (WPP) has been developed. According to the requirements of the Technical Regulation on the Approval of Rule for Review and Approval of a Company Waste Management Plan, the WMP contains the information on:

- the implementing company;
- the goals and objectives of waste management plan;
- waste management hierarchy and principles;
- produced wastes;
- measures considered for waste prevention and recovery;
- Description of separation methods for generated waste;
- Methods and conditions for temporary storage of wastes;
- Requirements to waste transportation;
- waste treatment methods as well as information on persons/organizations to which the waste will be handed over for further treatment considering currently available treatment capabilities;
- Requirements for safe handling of waste;
- Waste control methods.

This WMP sets the rules for collection, transportation, disposal, neutralization and utilization of wastes expected during the construction and operation of Ruisi WPP which are compliant to the requirements of environmental, sanitary-hygienic and epidemiological norms and regulations.

The main objectives of the waste management process include:

- to ensure waste identification by their types;
- to ensure separated collection of waste, to provide conditions required for safe temporary storage of waste to prevent adverse environmental and health effects;

[10] Resolution #446 of the Government of Georgia on the Approval of Regulatory Rule for Some Liabilities Envisaged by the Waste Management Code, dated 16th September 2016, Tbilisi City. As amended, until 1st January 2020 natural person or legal persons were freed from the obligation to prepare a company WMP if they performed an economic activities listed in the National Nomenclature of Georgia approved by Resolution #10 of the National Statistics Office of Georgia from 28th July 2016 or any other economic activity and produced 120 kg or less hazardous waste during the year.

- to ensure proper conditions for waste transportation to avoid leakage or loss of waste, development of emergency situations, damage to the environment and human health;
- to use of neutralization, recycling or utilization methods that are safe for the environment and human health;
- to reduce amount of waste;
- to reuse waste;
- to define responsibilities of personnel in the area of waste management;
- to ensure recordkeeping on industrial and household wastes;
- This WMP covers all types of the planned activities that would generate waste, including:
- Activities under regular operation mode;
- Activities under irregular operational conditions (e.g. during repair/construction works);
- Activities under emergency conditions.

All personnel and contractors of the implementing company – JSC Wind Power are liable to fulfil the requirements of the WMP.

Table 1.1 Company information

Implementing company	JSC Wind Power
Legal address of company	Zurab Avalishvili Street No.12, 0179, Tbilisi, Georgia.
Actual address of company	Zurab Avalishvili Street No.12, 0179, Tbilisi, Georgia.
Project location	Kareli Municipality. Adjacent to the villages of Ruisi, Urbnisi, Sagholasheni, Breti, Sakasheti and Sasireti.
Type of planned activity	Construction and operation of Ruisi Wind Power Plant
Contact information of JSC Wind Power:	
Identification code	402013904
E-mail	zbakuradze@peri.ge
Contact person:	Zaza Bakuradze
Contact phone	(+995 599) 252042
Consultation company:	WEG Envi Consulting LLC
Director of WEG Envi Consulting LLC	M. Kimeridze
Contact phone	Mobile: (+995 599) 154 656; Tel: (+995 32) 2 388 358;

2. Waste Management Policy and Standards

The WMP of JSC Wind Power has been developed on the basis of national and international standard documents, with account of requirements in the area of waste management.

In order to take into consideration changes related with environmental standards, it is necessary to periodically track the legislation.

This chapter contains national and international requirements in the area of waste management that shall be followed during the whole lifetime of the Project.

2.1 National Legislation and Requirements

In Georgia the management of waste and chemicals is regulated by the following legislation:[11]

Laws

- Waste Management Code
- On Environmental Protection
- On Licenses and Permits
- On Transit and Import of Waste on Territory of Georgia
- On State Control over Environment Protection
- On Pesticides and Agrochemicals
- Administrative Offences Code of the Georgia
- Environmental Assessment Code
- Resolutions/Orders/By-laws
- On Establishing the List of Wastes and their Classification by Types and Characteristics, Resolution #426 of Government of Georgia, dated 17th August 2015, Tbilisi;
- Resolution #115 of Government of Georgia from 7th March 2016 on Amendment of Resolution #426 of Government of Georgia from 17th August 2015 on Establishing the List of Wastes and their Classification by Types and Characteristics, Tbilisi;
- Resolution #143 of Government of Georgia on Waste Transportation Rule, dated 29th March 2016, Tbilisi;
- Resolution #144 of Government of Georgia on Registration Rule and Conditions for Collection, Transportation, Preliminary Treatment and Temporary Storage of Wastes ", dated 29th March 2016, Tbilisi;
- Resolution #145 of Government of Georgia on Special Requirements on Collection and Treatment of Hazardous Waste, dated 29th March 2016, Tbilisi;
- Resolution #159 of Government of Georgia on Approval of Technical Regulation on Rule for Collection and Treatment of Municipal Waste, dated 1st April 2016, Tbilisi;
- Resolution #422 of Government of Georgia on Form and Content for Recordkeeping and Reporting on Wastes, dated 11th August 2015, Tbilisi;
- Order #211 of the Minister of Environment and Natural Resources Protection of Georgia on Approval of Rule for Reviewing and Accepting a Company Waste Management Plan, dated 4th August 2015, Tbilisi;

[11] Ministry of Environmental Protection and Agriculture of Georgia

- Resolution #446 of Government of Georgia on Approval of Regulation Rules for Some Responsibilities Defined by the Waste Management Code, dated 16th September 2016;
- Normative by-laws approved by various Ministries and Departments.

2.2 Waste Management Hierarchy and Principles

Waste management policy in Georgia and Georgian legislation in waste management area are based on the following waste management hierarchy:

- Prevention;
- Preparation for reuse;
- Recycling;
- Other types of recovery, including energy recovery;
- Disposal.

When determining specific responsibilities in respect to the waste management hierarchy, the following should be taken into account:

- Environmental benefits;
- Technical feasibility when relevant best available technique is used;
- Economic viability.

Waste management shall be carried out without jeopardizing the environment and human health, specifically in a manner that waste management does not:

- Poses a threat to water, air, soil, flora and fauna;
- Causes noise or odour nuisance;
- Affect adversely the territory of the country, especially protected areas and cultural heritage sites.

Waste management should be performed based on the following principles:

- "Precaution" principle - measures shall be taken to prevent the threats that waste may pose to the environment even if there are no scientifically proven data on such risks;
- "Polluter Pays" principle - a waste producer or holder is obliged to cover costs related with waste management;
- "Proximity" principle - waste shall be treated at the nearest waste treatment facility, taking into account environmental and economic efficiency;
- "Self-sufficiency" principle - an integrated and adequate network of disposal and recovery facilities shall be established and operated.

2.3 Classification of Wastes

Waste Management Code [Article 3] determines the term "**waste**" as "any substance or object that the holder of waste discards, intends to discard or is obliged to discard" [clause "a"].

Further measures of waste management significantly depend on classification that should be made on waste generation place. Segregation of wastes, observing their storage rules and, finally, their treatment/elimination – all require correct classification of wastes.

Person, responsible for waste management, is obliged to make classification of existing wastes according to current legislation and standards[4]. In case if general methodology of waste clsassification is not exhaustive, laboratory study/testing of waste samples should be carried out in order to ensure waste classification.

Tables 2.1 and 2.2 show waste classification and its defining parameters, that are set by Georgian Waste Management Code and EU directives.

Table 2.1 Waste classification and defining parameters according to Georgian Waste Management Code

Waste type	Definition
Hazardous waste	Waste with one or more characteristics attributed to the hazardous waste, namely: explosive; oxidizing; highly flammable; flammable; irritant; harmful; toxic; carcinogenic; corrosive; infectious; toxic for reproduction; mutagenic; sensitizing; ecotoxic; waste which releases toxic or very toxic gases in contact with water, air or an acid; waste capable after disposal to yield another substance which possesses any of the characteristics listed above.
Non-Hazardous Waste	Waste that does not fall under the definition of 'hazardous waste'
Household waste	Waste generated by households;
Municipal waste	Household waste, as well as other waste that are close to household waste in their characteristics and composition
Inert waste	Waste that does not undergo any significant physical, chemical or biological transformations: does not dissolve, burn, or come in any other chemical or physical reaction, biodegrade or affect other material in a manner that will cause environmental pollution or damage to human health.
Bio-degradable waste	Waste that may undergo anaerobic or aerobic decomposition.
Liquid waste	Waste existing in liquid form.
Animal waste	Wastes associated with animals (animal body, animal tissue, dung, meat production wastes, animal tests wastes, etc.).
Healthcare waste	Waste produced by medical institutions, medical laboratories, medical research centres, guardianship institutions, veterinary clinics, and pharmaceutical companies and warehouses.
Specific waste	Waste generated from products, which, due to their characteristics and major distribution, require specific management measures and special care after they become waste.

Table 2.2. Classification and characterisation of wastes according to EU directives

Waste type	Definition
Inert	According to the definition given in Article 2 of EU 1999/31/EEC Directive, represent waste that does not undergo any significant physical, chemical or biological transformations. Inert waste will not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm human health. The total leachability and pollutant content of the waste and the ecotoxicity of the leachate must be insignificant, and in particular not endanger the quality of surface water and/or groundwater.
Hazardous	Wastes that are defined in the Article 1(4) of 91/689/EEC Directive and have the following potential properties: explosive, acidity, highly flammable or flammable, irritant, toxic, carcinogenic, corrosive, infectious, teratogenic, mutagenic; emit very toxic or toxic gases in contact with air,

Waste type	Definition
	water or acid; wastes capable yielding another substances and eco-toxic substances.
Harmless	Waste that does not fall under the definitions given above.

3 Waste Types Expected during Proposed Activities

The WMP of JSC Wind Power has been prepared on the basis of the Waste Management Code (the Law of Georgia "Waste Management Code", dated 15th January 2015). This Plan contains:

- Information on generated wastes (source, type, composition, amount);
- Information on waste prevention and recovery measures (especially for hazardous wastes);
- Description of separation methods for generated waste;
- Methods and conditions for temporary storage of wastes;
- Requirements to waste transportation;
- Methods to be used for waste treatment and/or information about persons/organizations to which wastes will be handed over for further treatment;
- Requirements for safe handling of waste;
- Waste control methods.

The given WMP covers wastes that are expected throughout the planned activities of JSC Wind Power, including:

- Activities under regular operation mode;
- Activities under emergency conditions.

During the Company's activities waste generation is expected during the construction and operation of the WPP. Though, waste can also generate during emergency situations.

Considering activities, the Company will generate both hazardous and non-hazardous solid and liquid wastes.

Types, amounts and management arrangement of wastes generated during the planned operations of the Company are described in Table 3.1.

Table 3.1 Types, amounts and management arrangement of wastes generated during the planned operations of the Company

Waste Code	Name of Waste	Hazardous (Yes/No)	Hazardous Property	Physical State of Waste	Approximate Amount of Waste by Years		Disposal/ Recovery Operations	Waste Management/ Contractor Companies
					Construction Phase	Operation Phase		
					2020	2021		
Wastes from the manufacture, formulation, supply and use (MFSU) of coatings (paints, varnishes and vitreous enamels), adhesives, sealants and printing inks - group code 08								
08 01 Wastes from MFSU and removal of paint and varnish								
08 01 11*	Waste paint and varnish containing organic solvents or other hazardous substances	Yes	H 3 A- "flammable" H 6 - "hazardous"	Solid	40 kg	-	D10	Sanitari LLC
08 03 Wastes from MFSU of printing inks								
08 03 17*	Waste printing toner/ink containing hazardous substances	Yes	H15	Solid	10 kg	-	D10	Sanitari LLC
Wastes from shaping and physical and mechanical surface treatment of metals and plastics - group code 12								
12 01 Wastes from shaping and physical and mechanical surface treatment of metals and plastics								
12 01 10*	Synthetic machining oils	Yes	H 3-B - flammable H 5 - "hazardous"	Liquid/solid	30 kg	2 kg	D10	Sanitari LLC
12 01 13	Welding wastes	No	-	Solid	220 kg	-	R4	Will be delivered to scrap metal collection points, or handed to a relevant licenced company for further management
Oil wastes (except edible oils, and those in chapters 05, 12 and 19) - group code 13								
13 02 Waste engine, gear and lubricating oils								
13 02 08*	Other engine, gear and lubricating oils	Yes	H 3-B - flammable H 5 - "hazardous"	Liquid	35 l	1 l	D10	Sanitari LLC

Waste Code	Name of Waste	Hazardous (Yes/No)	Hazardous Property	Physical State of Waste	Approximate Amount of Waste by Years		Disposal/ Recovery Operations	Waste Management/ Contractor Companies
					Construction Phase	Operation Phase		
					2020	2021		
Waste packaging; absorbents, wiping cloths, filter materials and protective clothing not otherwise specified - groups code 15								
15 01 Packaging (including separately collected municipal packaging waste)								
15 01 06	Mixed packaging	No	-	Solid	1600 kg	30 kg	D1	Solid household waste will be landfilled, and/or paper and cardboard waste will be delivered to waste paper collection point
15 02 Absorbents, filter materials, wiping cloths and protective clothing								
15 02 02*	Absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by hazardous substances	Yes	H 15	Solid	70 kg	5 kg	D10	Sanitari LLC
Wastes not otherwise specified in the List - group 16								
16 01 End-of-life vehicles from different means of transport (including off-road machinery) and wastes from dismantling of end-of-life vehicles and vehicle maintenance (except 13, 14, 16 06 and 16 08)								
16 01 07*	Oil filters	Yes	H 5 - “hazardous” H-15	Solid	80 kg	3 kg	D10	Sanitari LLC
16 01 17	Ferrous metal	No	-	Solid	80 kg	2 kg	R4	Will be delivered to waste metal collection point
16 01 18	Non-ferrous metal	No	-	Solid				
Waste group 17 - Construction and demolition wastes (including excavated soil from contaminated sites)								
17 04 Metals (including their alloys)								
17 04 11	Cables other than those mentioned in 17 04 10	No	-	Solid	65 kg	10 kg	D1	Will be disposed on construction waste landfilled
17 05 Soil (including excavated soil from contaminated sites), stones and dredging spoil								
17 05 03*	Soil and stones containing hazardous substances	Yes	H 5 - “hazardous”	Solid	Waste amount depends on the volume of spilled oil and scale of the spill		D10	Sanitari LLC

Waste Code	Name of Waste	Hazardous (Yes/No)	Hazardous Property	Physical State of Waste	Approximate Amount of Waste by Years		Disposal/ Recovery Operations	Waste Management/ Contractor Companies
					Construction Phase	Operation Phase		
					2020	2021		
17 05 05 *	Spoil containing hazardous substances (soil and subsoil polluted with petroleum hydrocarbons)	Yes	H 5 - "hazardous"	Solid	Waste amount depends on the volume of spilled oil and scale of the spill		D10	Sanitari LLC
17 05 06	Spoil other than those mentioned in 17 05 05 (Spoil from earth moving works and excavation of foundations)	No	-	Solid	47,000 m^3	-	D1	Soil excavated during earth works will be fully used for backfilling of foundation tranches, arrangement of the road sub-base and other works. This soil will be temporarily stored at 10 stockpile sites
Waste Group 18 - Wastes from human or animal health care and/or related research (except kitchen and restaurant wastes not arising from immediate health care)								
18 01 Wastes from natal care, diagnosis, treatment or prevention of disease in humans								
18 01 03*	Wastes whose collection and disposal is subject to special requirements in order to prevent infection	Yes	H 6 - "toxic"	Solid/liquid	1,0 kg	0,1 kg	D10	Sanitari LLC
Waste Group 20 - Municipal wastes and similar commercial, industrial and institutional wastes including separately collected fractions								
20 03 Other municipal wastes								
20 03 01	Mixed municipal waste	No	-	Solid	65 m^3/yr	1.4 m^3/yr	D 1	These waste will be disposed at the household waste landfill

Sanitari LLC - activities of the company: enterprise that treats hazardous wastes (arrangement of bioremediation sites for treatment of soils contaminated with industrial chemical wastes and petroleum). Environmental Permit №000021, Code MD1, dated 08/10/2013. Basis for the permit issuance – Conclusion of the Environmental Expertise №51, dated 07.10.2013.
If required, the company can cooperate with other companies having the Environmental Permit for the waste treatment. Information about the mentioned companies is available at the following webpage: **http://maps.eiec.gov.ge** – Map/register of environmental permits.

4 Management Measures for Wastes Generated during Planned Activities

4.1 Waste Prevention and Recovery Measures

The following waste prevention and recovery measures will be applied during the implementation of the planned activities:

- Any construction materials, items and substances will be delivered to the site in amounts necessary for proper flow of construction works/ process technologies. There will be no long-term storage of materials on construction sites;
- Construction materials, structures and items needed for technological processes will be delivered to the site in ready-made form (i.e. ready concrete; aggregate materials, timber, etc.);
- During the procurement of construction materials, structures, items and materials for technological processes preference will be given environmentally safe and quality products.
- Preference will be given to reusable or recyclable, biodegradable or environmentally safe degradable substances, materials and chemicals;
- Boundaries of the construction corridor will be strictly controlled in order to avoid works beyond the demarcated areas and generation of additional inert wastes and vegetation wastes;
- If possible, generated wastes will be re-used (e.g. metal structures, polyethylene materials, etc.).

4.2 Recordkeeping and Reporting on Generated Wastes

The Waste Management Code (2015) [Article 29] requires from a company to keep a record of wastes, to report these data to the Ministry and to keep records during 3-year period.

The recordkeeping and reporting format and content are determined by Resolution #422 of Government of Georgia on Format and Content of Recording and Reporting of Waste", dated 11th August 2015, Tbilisi. Waste recording and reporting forms should be filled and submitted to the Ministry electronically, into the Waste Database. Recording/registration, storing and further management procedures for generated wastes will be described in the bound and numbered logbook. Records should be clear and contain sufficient information, namely: waste code, waste name, hazardousness (yes/no) and hazardous characteristics, amount, measurement unit, etc.

4.3 Collection, Disposal and Labelling of Generated Wastes

During the process of company's activities the method of separated collection of wastes by their types and hazard characteristics will be organized and implemented:

- Household wastes will be collected in containers placed at appropriate territories;
- Open storage will be used only for wastes and materials that do not contain or is not contaminated with hazardous substances;
- Ferrous scrap metal will be collected at waste generation locations;
- Hazardous substances packaging waste (wood, cardboard, polyethylene, glass, metal, etc.) will be collected in dedicated containers at waste generation locations;
- Solid hazardous wastes, such as: vehicle oil filters, oil contaminated wiping cloths and other wiping materials, empty cans from liquid paint, etc. will be collected on in dedicated containers located on temporary storage areas in vicinity of waste generation location;
- Out-of-date substances and other types of wastes will be collecred separately from materials needed for industrial and technological processes;
- Flammable wastes will be collecvted and disposed at a distance from sparking devices;
- Liquid hazardous wastes (oils, out-of-date chemicals, paint residues, etc.) will be collected separately in closed containers or tanks that are hermetic and protected from leaks. Liquid hazardous waste containers or tanks will be moved to the temporary storage area;

- Luminiscent light bulbs and other mercury-containing items will be placed in tightly closed polyethylenen bags and, then, cardboard packaging that excludes their damage. These wastes will be transported to temporary storage areas with ventilation.
- Wood/timber wastes will be collected at waste generation locations on designated territory;

It will be prohibited to:

- Store wastes for prolonged period of time at generation site;
- Place hazardous wastes in containers for solid household wastes;
- Mix liquid and solid hazardous wastes;
- Mix hazardous wastes with other typdes of wastes in order to neutralize them;
- Place disposable and reusable packaging for medical wastes near electric heating devices; collect these wastes without protective gloves and pressing them in containers by hand;
- Collect and store liquid hazardous wastes on open territory not-protected from atmospheric precipitates;
- Burn rubber and other wastes;
- Discharge/pour hazardous wastes inti underground and/or surface waters;
- Mechanically impact cartridges.

Person responsible for company's waste management is obliged to ensure marking of containers for waste collection with proper labels or signs in order to make possible determination of their content and presize description. Labeling is necessary for observing the waste management and safety rules. It is important and necessary to place warning and prohibitive signs/labels.

This should be performed with account of the following rules:

- Containers for hazardous wastes should be marked with appropriate warning signs;
- Hazardous wastes handling rules ahould be placed at areas of hazardous wastes disposal;
- Areas, where entrance without personal protective equipment is prohibited, should be marked with appropriate warning signs;
- Containers for household wastes should have appropriate marking signs;
- Areas of temporary storage of wastes (especially for hazardous wastes) should be marked with appropriate warning signs;
- In case of damage of warning signs on containers old signs should be replaced with new signs;
- All signs placed on containers for wastes and at temporary disposal areas, must be clearly readable to assist personnel easily understand meaning of signs;
- Warning signs should be in Georgian language in order to be understandable for personnel employed by the Company.

4.4 Methods and Conditions for Temporary Storage of Wastes

Spoil generated during the process of activities will be maximally used for project purposes.

For areas of temporary storage of wastes generated during the process of activities the following conditions should be taken into account:

- Both for construction and operation stages of the project the hazardous wastes storage warehouse will be arranged with observance of the following requirements::
- Warehouse will have appropriate marking and it will be protected from impact of atmospheric precipitates and unauthorized access of strangers;
- Floor and walls of warehouse will be covered with hard surface coating;

- Wastes will be placed in warehouse only paxckaged in hermetic containers with appropriate marking labels.
- Temporary storage grounds on territory of the site will be in accordance with the following requirements:
- Storage grounds will have hard cover;
- Grounds should have conveniemt access road for use by vehicles;
- Effective protection should be provided (shed, wastes placed in packaging, containers, etc.) in order to protect wastes from atmospheric precipitates and wind impact;
- Appropriate signs should be installed on perimeter of these grounds and storage grounds should be protected from unauthorized access of strangers.
- All types of hazardous wastes generated during the activities will be separated from non-hazardous wastes;
- Hazardous wastes will be placed in special designated containers;
- Solid and liquid wastes shall not be mixed;
- Containers for medical wastes shall have tight and hermetic lids that ensure absolute impermeability and moisture tightness; Containes shall be plased on grounds with hard cover that are easily accessible for vehicles;
- Grounds for temporary storage of hazardous wastes should be located at a distance from food preparation and consumption places;
- Environment pollution with hazardous substances at unforeseen and emergency situations will be reduced to minimum;
- Dissipation of wastes by wind should be excluded;
- In order to avoid damage, corrosion, weat/tear, etc. of waste storage containers will be selected containers made of appropriate materials.
- No new materials and substances will be placed on grounds allocated for temporary storage of wastes;
- Contact of animals with wastes should be avoided.
- Containers for wastes should correspond to sizes, shape, composition and hazardous grade of waste. Use of damaged containers will be strictly forbidden. Each container shall have lid. Hazardous ewastes should be separated from other types of wastes. Mixing of hazardous substances, as well as solid and liquid wastes shall be strictly forbidden.
- Areas for temporary storage of hazardous wastes should be covered in order to be protected from impact of atmospheric precipitates;
- Bottom of storage area shall be made of such material that do not come into reaction and do not absorb stored wastes. It shall be waterproof and prevent risks of waste spilling/scattering;
- It’s desirable to make racks and shelves for storing of wastes;
- In order to prevent and control access to hazardous waste environment the waste storage areas should be equipped with warning signs;
- Areas/grounds for temporary storage of hazardous wastes shall be equipped with fire-fighting system;
- Containers used for hazardous wastes should be plased in storage place in such a way to make access to wastes easy and safe;
- Area of temporary storage grounds shall be sufficient for washing and cleaning of containers;
- Grounds for temporary storage of wastes on territory of site should correspond to the following requirements:
- Grounds should have hard surface coating;

- Whole perimeter of storage grounds shall be fenced to avoid scattering/dispersal of hazardous substances;
- Storage grounds shall have convenient access road for vehicles;
- In order to protect wastes from impact of atmospheric precipitates and wind effective protection (shed, waste packaging, containers, etc.) shall be provided;
- Appropriate sings will be made on perimeter of storage grounds and territory will be protected from unauthorized access.

4.5 Rules for Handing Over and Transportation of Wastes

Transportation of wastes will be carried out with full observance of sanitary and environmental regulations:

- Loading/unloading of wastes and all operations related with transportation will be mechanized and hermetized as much as possible;
- Loss of wastes and their scattering during transportations is inadmissible;
- During transportation the person accompanying the wastes will have appropriate document – "Request on Removal of hazardous Wastes" that should be approved by management.
- After completion of transportation operarions the vehicle shall be cleaned, washed and rendered harmless (vehicle shall be washed in existing car-wash facilities, it is forbidden to wash vehicle in river);
- Vehicle used for transportation of wastes shall have warning sign.

At transportation of hazardous wastes the entity responsible for waste generation is obliged to prepare Information Sheet on Hazardous Wastes (see form of Information Sheet below) separately for each type of hazardous wastes that should contain information about origin of waste, classification and hazardous properties of waste as well as information about safety measures and first aid measures in case of accident. Information Sheet on Hazardous Wastes shall contain also samples of appropriate hazard grade signs for marking of containers/vehicles. This Information Sheet shall accompany hazardous wastes at every transportation operarion.

4.6 Treatment /Final Disposal of Wastes

- Household wastes collected in containers shall be removed upon accumulation (approximately 2-3 times per month) to nearest existing landfill.
- Other types of waste (slats, planks, etc.) should be re-used (if possible) or handed over to local municipality/population after undergoing appropriate procedures. Unusable part of vegetation waste will be removed to existing landfill.
- Metal waste will be removed to scrap metal collecting points.
- All kinds of hazardous waste upon accumulation shall be handed over for further management to contractor with appropriate license.
- Rock spoils will be used for project purposes as much as possible (for road repairs, back-filling, etc.). Unused soil will be disposed in spoil disposal sites. Placing of rock spoils in disposal sites will be carried out in accordance with appropriate conditions

4.7 General Requirements on Safe Handling of Wastes

- Personnel involved in waste management activities (collecting, storing, transporting, handing over/disposing) should be trained in safe working requirements and professional safety issues;
- Personnel should be provided with special clothing, footwear and individual protective equipment. If necessary personnel's clothing shall undergo the special treatment, especially after completion of operations related with hazardous wastes;
- Personnel must be able to provide first aid medical help in case of poisoning or injuries when working with wastes;

- No person shall be allowed to work without proper training, without special working clothes or in cases of signs of illness;
- It is forbidden to accumulate more wastes on waste storage areas than established amount. It is forbidden to place wastes close to spark- and heat-generating sources;
- When placing several types of waste together their compatibility shall be taken into account;
- It is forbidden to store unauthorized items, personal clothing in areas of waste storage. It is forbidden also to take meals in these areas;
- It is necessary to strictly observe personal hygiene rules when working with wastes, It is necessary to wash hands with water and soap before taking meal and after completion of work;
- In case of signs of poisoning the work must be stopped and person must turn to nearest medical facility and inform the management of structural unit about the incident;
- Areas for collection of inflammable wastes will be equipped with fire-fighting equipmemt. Smoking and open fire will be strictly prohibited in these areas;
- Personnel must be familiar with properties of wastes and fire-fighting rules. Extinguishing of inflated highly flammable and fuel liquids is possible with use of fire extinguishers and sand;
- It is forbidden to extinguish inflamed solvents with use of water.

4.8 Safety Measures and Prevention of Possible Emergency Situation during Waste Management Operations

Emergency response works can be carried out only by properly trained and briefed persons.

- Persons not involved in emergency response works must leave the danger zone.
- Spilled hazardous substances must be neutralized and removed immediately with use of sawdust or dry sand. Floors must be wiped with cloths and washed with water with use of detergents or 10% soda solution. During the cleaning works the personal protection equipment (respirators, gloves, etc.) must be used.
- Floors of premises should be kept in order. Floor covers must be chemical resistant to avoid absorbtion of hazardous substances. Rooms, where during the working process the hazardous substances are used or stored, must have appropriate warning signs.
- Areas used for oil storage areas shall have vessels for storing of lime and sand (for neutralization and collection of spilled liquids);
- In order to avoid explosion danger welding works are forbidden near the areas for storage of used oil.
- Foam shall be used during response on emergency situations related with inflammation of wastes. Fire-fighting equipment shall be installed close to areas where flammable wastes are disposed.
- In case of spills of electrolyte from batteries spill area shall be treated with use of sawdust, neutralized with use lime solution and then washed with water. Prior to discharge of electrolyte into sewage it must be neutralized with use of roasted lime solution.
- Areas where works related with lubricants are carried out must be equipped with tanks/vessels for collection of used oil and filters. Risks of polluting the soil and surface waters must be excluded.
- Spilled paints/varnishes or solvents must be removed immediately with use of sand or sawdust.

4.9 Responsibility on Waste Management Plan Implementation

Fulfilling of the requirements defined by the Waste Management Plan of the of JSC Wind Power is obligatory.

Manager of company is responsible for:

- Fulfilling of requirements of Georgian legislation on waste management during the process of management/handling of wastes generated during the company activities;
- Provision of equipment, resourses and inventory needed for implementation of waste management measures.
- Responsibility on fulfilment of duties established by Waste Management Code lays on company manager.

Environmental manager is responsible for:

- Performing internal control over fulfillment of requirements of Georgian legislation on waste management;
- Preparation, annual review and (if needed) renewal of company's Waste Management Plan and/or (in case of contractor company) provision of complete and reliable information regarding types of wastes, their amount, management issues, etc.;
- Organization of the process of waste management envisaged by the company's Waste Management Plan;
- Ensuring complete and correct fulfilment of requirements determined in the Waste Management Plan by company management and personnel;
- Carring out environmental, health and safety efficiency reporting with account of waste management aspects to company management and external entities such as governmental agencies and lenders;
- Determination of appropriate correcting and preventive measures and ensuring their implementation at the site in case of any violation or environmentta incident related with waste management;
- Submission of data on efficiency of waste management to appropriate governmental agencies in case of request from their side;
- Developing, reviewing and (if needed) renewing of internal procedures in order to fulfill requirements envisaged by the Waste Management Plan;
- Selection, contracting and performance control of the contractor company (with appropriate Environmental Permit) in order of ensuring further management of hazardous wastes;
- Contracting of licensed carrier company for transportation of wastes and/or obtaining of recommendation/permision from the Minstry of Environment;
- Performing of accounting/registration of wastes generated during company activities and reporting to the Ministry;
- Keeping close collaboration with personnel involved in environmental issues in order to ensure implementation of appropriate measures for reducing of waste generation and then, identification of all generated wastes, determination of their collection, transportation and disposal procedures and environmentall acceptable possibilities for their re-use, recovery, recycling, management and disposal;
- Provision of official training programs on requirements of the Waste Management Plan for employed personnel and familiarize them with general requirements on safe handling of wastes.
- Receiving of complaints from local population regarding the waste management or disposal and timely response on such complaints together with company management;
- Supporting of complaints control process.

Environmental specialist at the structural unit is responsible for:

- Implementation of appropriate waste management measures according to the Waste Management Plan within the structural unit of the company that is under his/her control;
- Informing of company's Environmental Manager about any occurred violation or environmental incident related with waste management issues, determining of appropriate correcting and

preventing measures together with him and ensuring their implementation at the site;

- Sistematic inspection of temporary waste storage areas and condition of waste storage containers (damage, corrosion or wear);
- Ensuring of labeling of waste storage containers with appropriate labels or signs in order to make possible determination of contents and correct accounting of wastes placed in these containers. This is also necessary for observation of waste management and safety rules;
- Performing of record keeping on types of generated wastes, their amount, transportation in log that will be binded and numbered. Records must be clear and contain sufficient information;
- Performing of waste transportation control from site in order to ensure correct final disposal of wastes;
- Preparation of quarterly report (information) on waste management issues and submission to company's Environmental Manager;
- Instructing of employed personnel on waste related issues and familiarize them with general requirements on safe handling of wastes.

4.10 Monitoring of Waste Management

Monitoring of waste management includes regular visual inspection and waste management control.

Monitoring covers the following processes/components:

- Review of the company's Waste Management Plan, its renewal (if needed) and/or making changes;
- Records on waste accounting/registration/transportation issues;
- Control of contract dates for waste management related agreements;
- Equipment and inventory used for implementation of waste management measures;
- Identification of new sources of waste generation and new types of wastes;
- Changes in waste amounts (volumes);
- Areas for temporary storage of waste;
- Technical condition of containers for waste storage;
- Labeling of containers for waste storage (wear/loss);

Monitoring results are used for assessment of risks of impact on environment from wastes and determinining of mitigation measures; assessment of efficiency of measures envisaged by the Waste Management Plan. In case of incompatibilities correcting measures will be developed.

4.11 Updating, Reviewing and Correcting of the Waste Management Plan and Training

This Plan is a "live document". That means that (1) it is never completed and never comes to the end, (2) it must be reviewed at least once in a year, (3) reviews require participation of the Emergency Situations Manager, (4) document renewal should be made in a fast pace. Each emergency response system should be tested periodically, obtained experience should be recorded and weak links must be corrected (the same should be carried out in case of real incidents).

At the same time, training is necessary – all personnel must be trained on emergency response plan actions. Personal training registration system should be established and training records documentation should be kept at offices of company or contractors.

Review:

Annual (at least) review of the Plan must cover the following issues:

- Calling to persons listed in the Notification List in order to check that these persons are still working on the same positions and their phone numbers are correct.

Correction:

Plan must incorporate changes related with contact persons, responsibilities, services or information about risks. Operator is responsible for renewing of the Plan document. Copy of the Plan that belongs to Operator is considered as main copy. In case of changes the Operator must supply altered pages and change review list to all persons who have the Emergency Response Plan. Document owners are obliged to make appropriate changes and renew their copies. Old pages must be destroyed immediately in order to avoid uncertainty.

Trainings:

Periodic training and drills ensure personnel readiness for implementation of the Plan and understanding of individual responsibilities and functions. Drills include:

- Field drills;
- Phone drills;

Wind power plan operator must carry out field and phone drills annually. Field drills assume simple meeting where persons responsible for the Plan explaining functions and responsibilities given in the Plan. Such drills are especially necessary for new personnel and leaders.

Signs of hazardous waste, warning and prohibiting signs

 Highly hazardous solid substances	 Other hazardous substances and items	 Oxydizing substance	 Irritating, Harmful
 Highly flammable gases	 Toxic gases	 Toxic substances	 Eco-toxic substances
 No smoking	 recyclable	 For household wastes	 Flammable

Hazardous Waste Information Sheet

<table>
<tr><td colspan="2">Hazardous Waste Code</td><td colspan="3">Hazardous Waste Name</td></tr>
<tr><td rowspan="3">Hazardous Properties</td><td colspan="2">Classification system</td><td>H Codes</td><td>Hazard Degree Characteristics</td></tr>
<tr><td colspan="2">Basic:</td><td></td><td></td></tr>
<tr><td colspan="2">Additional:</td><td></td><td></td></tr>
<tr><td>Process/Activity generating hazardous wastes</td><td colspan="4"></td></tr>
<tr><td>Physical properties</td><td>Solid □
Liquid □
Sediment □
Gas □</td><td colspan="3">Note</td></tr>
<tr><td>Chemical properties</td><td>Acid □
Alkali □
Organic □
Inorganic □
Soluble □
Insoluble □</td><td colspan="3">Note</td></tr>
<tr><td colspan="2">Type of packaging or container</td><td colspan="3">Hazard degree signs that should be used during storage/transportation</td></tr>
<tr><td colspan="2">First aid</td><td colspan="3">Measures at emergency situations</td></tr>
</table>

Hazardous Wastes Transportation Form

1. Sender

Company	Contact person	Address/phone

2. Receiver

Company	Contact person	Address/phone

3. Loading place

Company	Contact person	Address/phone

4. Unloading place

Company	Contact personal	Address/phone

5. Carrier №1

Company	**Contact person**	**Address/phone:**	**Vehicle registration number plate:**	**Trailer registration number plate:**	**Railway carrier N:**

6. Carrier № 2

Company	**Contact person**	**Address/phone:**	**Vehicle registration number plate:**	**Trailer registration number plate:**	**Railway carrier N:**

Transporting

7. №	8. Waste code	9. Waste name	10. Amount (kg)

Confirmation:

11.Wastes handed over to carrier	12. Wastes received by carrier	13. Wastes handed over to receiver	14. Wastes received for storage/recovery/disposal
Date/Time	Date/Time	Date/Time	Date/Time
Sender’s signature	Carrier’s signature	Carrier’s signature	Receiver’s signature