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Study

REPORT ON ENVIRONMENTAL IMPACT OF THE "BIĘCINO" WIND FARM WITH ASSOCIATED INFRASTRUCTURE IN THE BIĘCINO AND KARŻNICZKA PRECINCTS, DAMNICA COMMUNE (Damnica Commune, Słupsk Poviat, Pomeranian Voivodeship)

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2. Local Spatial Development Plan in the Damnica Commune in the Bięcino and Karżniczka precincts adopted by the Resolution No. XLVIII/331/10 of the Damnica Commune Council on 21 April 2010.
3. Letter of the Head of Damnica Commune (ref. no. WF.6724.4-1.2012) of 9 October 2012 specifying the nature of development surrounding the "Bięcino" wind farm and the letter of the Head of Damnica Commune (ref. no. WF.6724.1.2013). of 17 January 2013 specifying the nature of development for the plot no. 30, Karżniczka precinct.
4. Environmental inventory report for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune (Haplicznik, Kaszewska-Mejer, Jaśkiewicz and Szmigiel 2012).
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6. Report from avifauna monitoring for the "Bięcino" Wind Farm (Antczak 2010).

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Appendix 1 "Bięcino" Wind Farm. Environmental impact report - location of wind farms (1:10 000).

1. LEGAL BASES AND SCOPE OF THE STUDY

1.1. Legal bases

The subject-matter of the study is the environmental impact report of the investment consisting in construction of the "Bięcino" wind farm **with associated infrastructure in the Bięcino and Karżniczka precincts, Damnica Commune,** composed of 13 wind farms, "Bięcino" main reception point (MRP) station, MV power lines connecting the planned wind power plants with the planned „Bięcino" MRP and associated facilities (including access roads, assembly yards, power and telecommunications infrastructure), hereinafter referred to as the "Bięcino" Wind Farm.
Location of the investment is presented on figure 1.
The report was drawn-up with regard to application for issuing of the environmental permit for the investment.
Pursuant to the Act of 3 October 2008 on the provision of information on the environment and its protection, public participation in environmental protection and on the environmental impact assessments (Journal of Laws of 2008 No. 199, item 1227 as amended) and Ordinance of the Council of Ministers of 9 November 2010 on the investments of potentially significant environmental impact (Journal of Laws No. 213, item 1397), investment entitled **"Bięcino" Wind Farm** with technical infrastructure, including:

- installations using wind power to produce energy of a total height of at least 30 m (§ 3(1)(6));
- power stations of rated voltage of at least 110 kV (§ 3(1)(7));

is included into the category of establishments of potentially significant environmental impact. With regard to the above, the initiative requires the environmental permit for its implementation.
The decision on the obligation to perform the environmental impact assessment and on the scope of environmental impact report for construction **of the "Bięcino" Wind Farm** with associated infrastructure was issued by the Head of Damnica Commune (**Appendix 1**).

1.2. Scope of the report

The decision of the Head of Damnica Commune (Appendix 1) contains the requirement of drawing-up of the report pursuant to Article 66, paragraph 1, paragraph 2, paragraph 6 and Article 67 of the Act of 3 October 2008 on the provision of information on the environment and its protection, public participation in environmental protection and on the environmental impact assessments (Journal of Laws of 2008 No. 199, item 1227 as amended) with particular consideration of the following specific aspects (see **Appendix 1**):

a) *Potential electromagnetic field and noise impact - aspects addressed* in chapters 7.1.4, 7.1.5, 7.2.8, 7.2.10, 7.3.5 and 7.3.6.;

b) *Environmental specification of the area of the investment with consideration to the types of natural habitats, species habitats and the protected flora, fauna and fungi species under the Act on nature conservation of 16 April 2004* - aspects addressed in chapter 3.2.2.;

c) *Pre-execution monitoring in order to obtain quantitative information on the use of the investment area and surrounding areas by birds in all periods of their annual life cycle (breeding period, post-breeding dispersal, autumn migration, wintering and spring migration). Monitoring should include:*

- *species composition and abundance of avifauna in annual cycle;*

- *abundance of all species listed in the annex I and II to the Birds Directive (2008/147/EC) and bird species covered with species protection in Poland,*
- *density of all bird species in main seasons of the year,*
- *volume and use of air space by all bird species - in particular large birds, raptors, long distance migrating birds and birds concentrating on feeding grounds and sleeping areas at night (flight height, time and manner of land use - e.g. sleeping area, feeding ground, breeding area) - with identification of the location of sleeping and feeding grounds of the individuals detected in the area of the investment;*
- *aspect addressed in chapters 3.2.2.2 - 4;*

d) Pre-execution monitoring of bats including: bat voice records, analysis of records and specifying the bat activity indices along with valuation of the obtained data, inspections of the potential bats' breeding colony sites, inspections of facilities that could be used as bat wintering sites - aspect addressed in chapter 3.2.2.4;

e) wind farm impact on the mortality of birds and bats in effect of collision with consideration to the proposed type of wind power plants (i.e. tower height, rotor diameter, lighting, maximum linear speed of rotor blade tops, number of turbines, etc.); - aspect addressed in chapter 7.2.7.;

f) Impact assessment of wind farms on the forced change of bird migration routes and forced change of use of space by the bats - aspect addressed in chapter 7.2.7.;

g) Determination of direct damage or reduction of protected species habitats in context of implementation of the investment (with consideration to the areas of feeding, inhabiting or resting birds concentration during the spring and autumn migrations and in the wintering period) - aspect addressed in chapter 7.2.6 and 7.2.7.;

h) Determination of cumulative impact of the investment with the other existing or planned wind farms - aspect addressed in chapter 9.9.2.;

i) Determination of the location of infrastructure necessary for operation of the power plant connecting the wind farm with power station, automatic control station for operation of the wind farm, route of grid connecting this station with the wind farm - aspect addressed in the cartographic appendix;

j) Investment impact assessment on bird and bat species upon introduction of any and all possible measures mitigating the adverse impact aspect addressed in chapter 7.2.7.;

k) Risk assessment for the loss of advantageous conservation status by local populations of species covered with species protection in Poland - issues addressed in chapters 7.2.6. and 7.2.7.;

l) Proposed post-implementation monitoring covering mortality and changes in volume and use of air space by birds and bats in effect of collision with power plant at the stage of the facility exploitation - aspect addressed in chapter 10;

m) Determination of estimated environmental impact of the analysed scenarios - aspect addressed in chapter 6.

Environmental impact report of the "Bięcino" wind farm covers all aspects laid down in Article 66 of the Act of 3 October 2008 on the provision of information on the environment and its protection, public participation in environmental protection and on the environmental impact assessments (Journal of Laws of 2008 No. 199, item 1227 as amended) with particular consideration of the above-mentioned requirements of the decision of the Head of Damnica Commune (**Appendix 1**).

Text appendices 1 - 9 and cartographic appendix form the integral parts of the "Report ...".

1.3. Information sources

The environmental impact report of the "Bięcino" wind farm covers the issues laid down in the aforementioned Article 66 of the Act of 3 October 2008 on the provision of information on the environment and its protection, public participation in environmental protection and on the environmental impact assessments (Journal of Laws of 2008 No. 199, item 1227 as amended) with consideration to the requirements of the decision of the Head of Damnica Commune (**Appendix 1**).
The "Report...” is drawn-up with the use of the following materials:

- design concept of the investment provided by the Contracting Party - "EEC Elektrownie Wiatrowe” Sp. z o.o. - sp. k. company in Legnica;
- field inspection concerning ecophysiography, sozology and landscape carried out in August 2012;
- environmental monitoring covering inventory of habitats and vegetation in the location of the investment:
  - habitat, flora and fauna inventory (excluding birds, bats and insects) included in the "Environmental inventory report for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune" (Haplicznik, Kaszewska-Mejer, Jaśkiewicz and Szmigiel 2012) - **Appendix 4**.
  - entomofauna inventory included in the "Report from entomofauna inventory for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune" (Haplicznik, Lasecki, Szmigiel 2012) - **Appendix 5**.
  - ornithological monitoring of the investment area (see chapter 3.2.5.3) published in the Report from avifauna monitoring for the "Bięcino" Wind Farm (Antczak 2010) - **Appendix 6** ;
  - chiropterological monitoring of the investment area (see chapter 3.2.5.4) published in the "Potential impact report and assessment of the planned location of the "Bięcino" Wind Farm on bats” (Kościów 2010) - **Appendix 7**.
- information provided on the General Directorate for Environmental Protection website (www.gdos.gov.pl);
- information provided by the Regional Directorate for Environmental Protection in Gdansk (www.gdansk.rdos.gov.pl);
- information provided on the official website of the Marshal Office of the Pomeranian Voivodeship (www.woj-pomorskie.pl);
- archive materials of the Damnica Commune Office;
- archive materials of the "PROEKO” Ecological Design and Implementation Office (EDIO) in Gdansk;
- published materials concerning the methodological aspects of environmental impact assessments;
- published materials concerning the area of the investment location and its regional surroundings;
- acts of common and local law pertaining to environmental protection.

Complete list of information sources, in the form of published and archive materials and legal acts forming a basis for preparation of the "Report...” is provided in chapter 14.

2. DESCRIPTION OF THE PLANNED INVESTMENT

2.1. Planned investment - baseline scenario

The planned investment is situated in the Pomeranian Voivodeship, in the central part of the Słupsk Poviat in Damnica Commune (Fig. 1).
The subject-matter of the investment is the construction of "Bięcino" wind farm of the total maximum power of approx. 39 MW with the following essential components (cartographic appendix):

1) 13 wind farms of the total power up to approx. 39 MW, placed on reinforced-concrete foundations and equipped with assembly platforms of hardened surface,
2) access roads connecting the wind farms with public roads,
3) modernised forest, commune, poviat and voivodeship roads and necessary exits from these roads,
4) MRP power station >Bięcino< MV/110 kV,
5) cable (underground) MV power grid connecting the wind farms with subscriber MRP power stations of approx. 6 km length,
6) cable (underground) telecommunications network connecting the power plants with automatic control station,

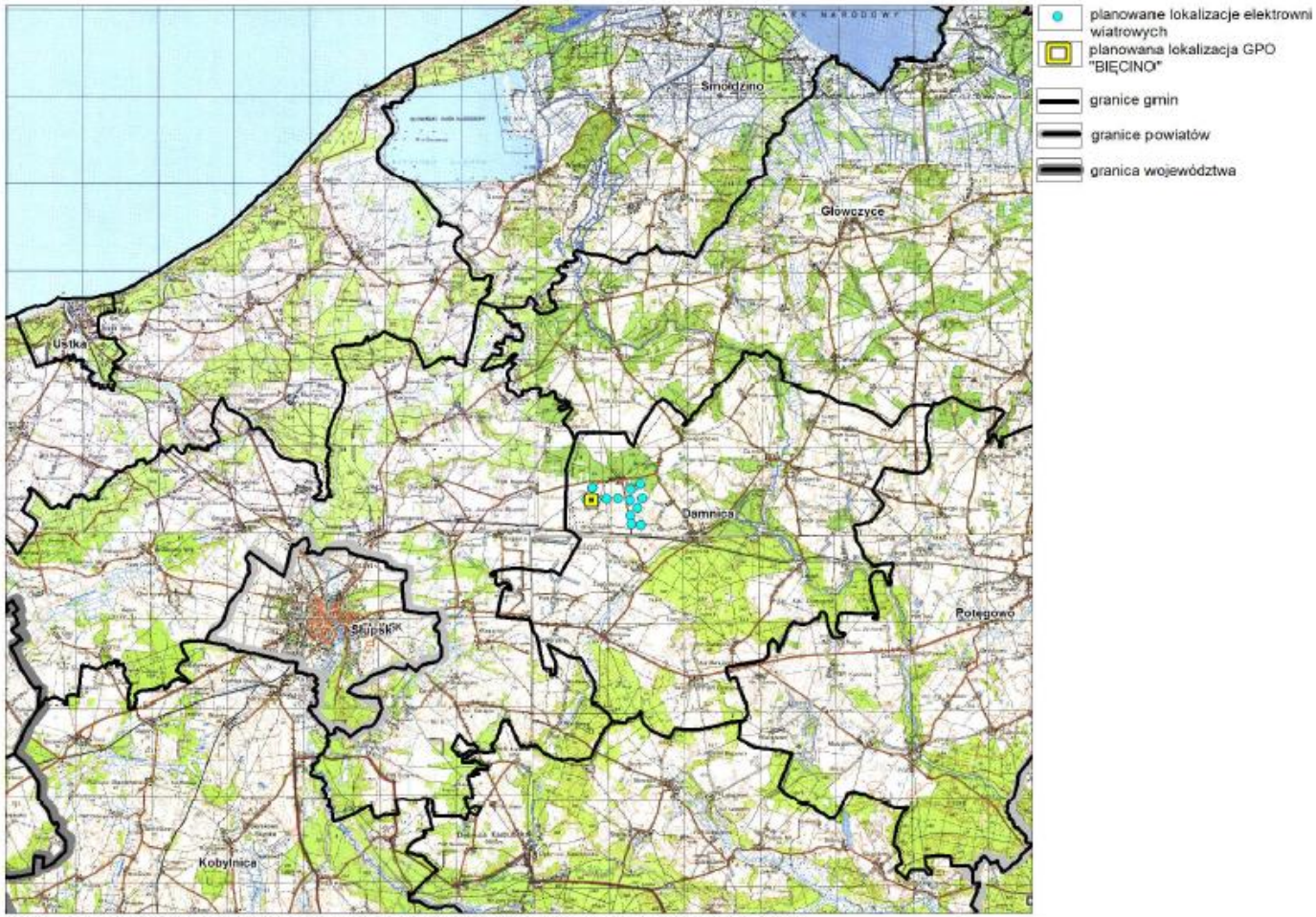
Within the planned investment, turbines meeting the following parameters are anticipated:

1) maximum power up to approx. 3 MW (each),
2) maximum height at the highest rotor blade position of 170 +/- 5 %, including tower up to 120 m +/- 5%.
3) maximum sound power at the level not exceeding the maximum permissible noise level as laid down in the environmental protection law, at the borderline of the residential housing areas or any other development intended for permanent stay of inhabitants and at the borderline of such areas delineated in the local spatial development plans.

In addition, all power plants shall meet the following requirements:

- marking of aviation obstacle (external ends of rotor blades painted in 5 stripes of equal width, perpendicular to the rotor axis and covering 1/3 of the rotor length - 3 red or orange stripes and 2 white);
- steel tower structure - pipe, segment and solid structure;
- power plant structure in white or grey colour (harmonised colour palette for the entire wind farm);
- prohibition of installing advertising billboards, excluding the signs (logos) of manufacturer or investor or equipment owner.

The "Bięcino" wind farm with acoustic impact zone will be situated in the Damnica Commune (Słupsk Poviat, Pomeranian Voivodeship) within the following geodetic precincts: Bięcino and Karżniczka (table 1).



Rys. 1 Położenie planowanego zespołu elektrowni wiatrowych "Bięcino" na tle podziału administracyjnego. (1:150.000)

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planowane lokalizacje elektrowni wiatrowych	planned locations of wind farms
planowana lokalizacja GPO "BIĘCINO"	planned location of "BIĘCINO" MRP
granice gmin	commune borders
granice powiatów	poviat borders
granica województwa	voivodeship border
Rys. 1 Położenie planowanego zespołu elektrowni wiatrowych "Bęcino" na tle podziału administracyjnego (1:150.000)	Fig. 1 Location of the planned "Bięcino" wind farm against administrative division (1:150 000)
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Table 1 Number of geodetic plots of location of the "Bięcino" wind farm

No.	Plot No.	Precinct	Infrastructure			
			WF[1)]	RO[2)]	MV[3)]	MRP[4)]
1	24	Bięcino		x		
2	28	Bięcino	x	x	x	
3	29	Bięcino	x (sweeping area)			
4	34	Bięcino	x (sweeping area)			
5	35	Bięcino	x (sweeping area)			
6	36/1	Bięcino	x	x	x	x
7	36/2	Bięcino	x	x	x	x
8	55	Bięcino		x	x	
9	162	Bięcino		x	x	
10	163	Bięcino	x	x	x	
11	183	Bięcino		x	x	
12	184	Bięcino	x	x	x	
13	186	Bięcino		x		
14	189	Bięcino		x	x	
15	195	Bięcino	x	x	x	
16	200	Bięcino	x	x	x	
17	201	Bięcino		x	x	
18	202	Bięcino	x (sweeping area)			
19	203	Bięcino	x	x	x	
20	204	Bięcino	x	x	x	
21	205	Bięcino		x		
22	255	Bięcino		x	x	
23	256	Bięcino		x	x	
24	15	Karżniczka		x	x	
25	16	Karżniczka	x	x	x	
26	17	Karżniczka	x	x	x	

1) - wind farms (WF),
2) - access roads, assembly yards, reconstructed roads
3) - cable power grid [MV), pipeline system and transmission lines
4) - power station MV/110kV (MRP)
(sweeping area) - rotor sweeping area

Source: Application for environmental permit for the investment.

The total area assigned for implementation of the "Bięcino" wind farm, including foundations, access and service roads related to exploitation of wind farms is approx. **6.5 ha**. This area does not include temporary roads and access roads that will be decommissioned upon completion of construction of the wind farm or will be used as agricultural or forest areas.
Construction area for a single wind farm tower including access roads and assembly yards will be approx. 4800 m^2.
The areas of planned "Bięcino" MRP subscriber station will cover up to 1.0 ha within impassable lines.
Width of access roads will be of approx. 6 m in demarcating lines. Cable connections between the planned wind farms and the MRP station will be installed on underground basis and therefore will require no exclusion of lands from exploitation.

Location of the investment against:

- **wetlands and any other area of shallow groundwater level** - no wetlands in the location of the wind farm and associated infrastructure are identified, whereas a

small wetland - bog area of approx. 1 ha is situated near the planned access road no. 1 to the wind farm, similar areas are present in a distance of approx. 350 m from power plant no. 2 (see cartographic appendix). The largest wetland - bog area is located near the Mortuś Lake in a distance of approx. 2 km towards north-east from the nearest of the planned wind farms;

- **coastline areas** - minimum distance of wind farm from the Baltic Sea coastline is 19 km;
- **forest areas** - the nearest power plant of the "Bięcino" wind farm against the forest areas is power plant no. 7 situated in a distance of approx. 140 m from the forest (see cartographic appendix), the route of MV cable lines is located outside the forest areas;
- **protected areas, including protection zones of water intakes and of inland reservoirs** - location of the investment against the nature protection form is presented in chapter 4. There are no protection zones of water intakes or of inland reservoirs within the location of the investment.

The nearest water intake with the delineated direct protection zone is situated in the Bięcino locality in a distance of approx. 800 m from the nearest wind power plant.
The planned "Bięcino" wind farm is situated outside the range of the Main Groundwater Reservoir (MGR). The nearest MGR to the "Bięcino" wind farm is reservoir no. 115 "Łupawa" situated in a distance from the nearest of the planned wind power plants of approx. 6.5 km towards east.

- **areas with exceeded environmental quality standards** - the location of the investment is planned outside the areas with exceeded environmental quality standards;
- **areas with historical, cultural or archaeological landscape** - the location of the investment is planned outside the areas with historical, cultural or archaeological landscape.

The nearest historical monument is situated in a distance of approx. 750 m (house with arcade in Bięcino dated back to 19th century).
The "Bięcino" wind farm is located partially (power plants 1-4 - see cartographic appendix) within the limited and partial archaeological conservatory protection - there are no facilities of landscape importance.

- **areas adjoining directly to lakes, rivers and other water reservoirs** (with specification of a distance of this investment from the coastline) - there are no lakes in the area of the investment - the nearest lake to the planned investment is the Mortuś Lake in a distance of approx. 2 km from the wind farm, whereas the nearest river is Charstnica in a distance of approx. 1.5 km towards south-east.
- **health resorts and health resort protection areas** - the location of the investment is planned outside the health resorts and health resort protection areas - the nearest health resort is Ustka in a distance of approx. 20 km towards north-west.

Population density in the Damnica Commune is low and mounts to 37.9 persons/km^2 .
The nearest area of high population density is the City of Słupsk situated in a distance of approx. 10 km with population density as of 2011 was 2250 persons/km2 (according to the Central Statistical Office data);
Location of the investment against the nature protection forms is presented in chapter 4.

Type of technology

Power produced in effect of the use of kinetic wind power in the wind power plants of maximum power up to 3 MW each, will be transmitted with the medium-voltage underground power cables to the planned "Bięcino" MRP power stations, in which it

will be supplied by means of MW distribution stations (20 kV or 30 kV) onto the station transformers.
The station transformers will enable change of voltage from the level of wind farm generators (medium voltage - 20 kV or 30 kV) to 110 kV, which is adequate to transmit power to large distances.
Under construction of transformer station and connection of the MV cable, the following will be provided:

- power transformers placed on reinforced-concrete foundations;
- reactive power equipment,
- switchgear placed on the external support structures;
- electronic infrastructure to be located in the container building;
- access roads;
- station grounding and lightning protection installation;
- station security and automation systems;
- connectivity system (optic fibre);
- outer lighting system of the station area;
- levelling, drainage and fencing of the station area;
- greening of the station area and protective green planting.

Power obtained in effect of the wind farm operation will be transmitted with MV cables to the planned "Bięcino" MRP, from where it will be transmitted to the power station.
Power production technology with the use of wind plants and supplying this energy to the power grid is based on the following transformations and phenomena:

- aerodynamic i.e. transformation of wind energy into rotary motion of the rotor (rotor blades, power plant rotor);
- electromagnetic i.e. transformation of mechanic energy (rotary motion of the rotor) into power (power generator);
- electric power i.e. transformation and electric matching (in terms of voltage, frequency and phase) to the receiving grid (e.g. MRP transformer station) and on power transmission with power line to the grid.

Wind power plant consists in steel tower of pipe or segment structure and a head - nacelle equipped with power generator, a motor positioning the rotor against the wind, own vibration reducer and electronic protectors. Hub with rotor blades is made of plastics used in the aviation structures. Each blade of the power plant rotor is twisted individually in a way to maintain optimal operating conditions considering current wind pressure.
Control of the power plant operation is automatic. The control system programmes the parameters resulting in switching off the power plant depending on, among others, duration of exceed of the defined wind speed threshold, in the case of short circuit as well as in the case of electric discharges, disturbances on transmission lines or other failures.
Power plant is installed in the sites of their placement and of finished elements (sections of load-bearing pillar, rotor, nacelle) with the use of a crane. The power plants will be placed on monolithic, reinforced-concrete foundations.
The expected exploitation period of the "Bięcino" wind farm is circa 25-30 years. Wind farms are maintenance-free installations. To ensure proper functioning and exploitation supervision, the wind farm will be equipped in telecommunications infrastructure (a network of underground optical telecom cables laid in parallel to the power cables). For the purposes of data sharing between the individual power plants, the "Bięcino" MRP subscriber power station and power dispatch systems, an external ITC network enabling data transmission (optic fibre) will be installed.
Wind power plants to be used in the "Bięcino" wind farm will be the latest generation power plants of low rotary speed of the rotors and therefore of the lowest noise ratios.
The "Bięcino" MRP transformer station MV/110 kV, to be constructed within the investment, will be surrounded with a zone excluded from use - fenced area.
The design of the MRP power station anticipates the use of standard technical solutions and high-quality equipment commonly used in such facilities. The components of the designed power station include among others: transformer, separation and stormwater sewage systems, distribution station and control room, reactive power compensation systems, access roads, connection system, grounding systems and telecommunications network. The area of the station will include also the MV cable lines with optic fibre lines and grounding system. Transformer stations will be connected to the sanitary sewage system and when such connection is impossible, the drainless reservoirs or toi toi mobile toilettes will be installed. In the two latter cases, municipal sewage will be collected by a company with applicable permits.
The plots intended for transformer station development are situated on the area with no stormwater sewage system. Drainage system of the transformer station includes:

- inspection chamber made of reinforced-concrete shaft units;
- sedimentation tank made of reinforced-concrete shaft units;
- coalescing separator;
- sampling well;

- disposal to dry well.

Transformer station will be connected to the sanitary sewage system and when such connection is impossible, the drainless reservoir or toi toi mobile toilettes will be installed. In the two latter cases, municipal sewage will be collected by a company with applicable permits.

The internal road system connected with public roads will enable access of technical and maintenance services to wind power plants and to the subscriber power station. The roads will have hardened surface and lanes of approx. 6 m lanes (with extensions in the areas of bends and crossings).

In general, the access roads will be delineated on the existing local roads and the new roads will be delineated only when there is no access with the existing roads. Part of the existing poviat and commune roads will require significant reconstruction consisting in their extension to obtain lanes of approx. 6 m width and strengthening of the existing surface.

The areas of wind power plants location and location of the access roads and assembly yards will be subject to soil geotechnical surveys.

Medium voltage (MV) cable lines are to be laid in the trenches of approx. 1.2 m depth within the agricultural lands and approx. 1.1 at the remaining areas (road lane etc.) and of approx. 50-80 cm width. The cables (along with grounding cable) and optic fibre will be placed in the HDPE pipe or a pipe made of the other applicable insulation materials of a diameter specified in the construction regulations.

In order to lay the MV cable line, the trenches at the areas of low underground utilities density are to be made with the use of mechanical equipment. At the areas of dense infrastructure and near the trees, the trenches will be made with the use of construction "micro-machines" (specialist mini-excavators for narrow trenches used for cable lying, manual soil thickeners of 'foot' type), made manually or using any other method ensuring minimal size of trenches. Trees growing near the trenches will be protected by straw mats or protective nets.

The power cable lines in soil can be also laid using a plough (using so called ploughing method).

In the case of location of power line using the ploughing method, its location in soil consists in furrow clearance and laying the cable directly in soil using a special plough structure. Furrow cleared by a plough is relatively small (comparing to the size of trenches in the previously described method). Application of this method results in no significant disturbance of the soil structure and borrow material production. Furrow is liquidated by backfill and soil cover is rehabilitated. This method is applied primarily on the areas with no underground infrastructure. No borrow material is produced in this method. Due to potential collisions, the ploughing method is used on the areas with no underground infrastructure.

Crossings with hardened roads and watercourses will be made using the controlled drill or jacking method or any other method agreed with the competent authority (for roads - by road administrator). Excavated soil masses are used on site. Any potential surplus will be disposed. No trench drainage is planned.

Estimated volume of consumed water and other raw materials, materials, fuels and energy

At the construction stage, the analysed investment will consume differentiated volumes of raw materials, materials, fuels an energy (see chapter 9.2.). This shall apply, apart from the construction materials, primarily to water consumption for utility purposes of the construction teams, fuels for construction equipment and transport.

Water consumption for utility purposes at the construction stage will be limited to approx. 5-6 dm^3/person/day. The area of the investment will be connected to the water

supply and sewage system or, if such technical option is not viable, water will be supplied in containers and sewage collected by an external company with applicable permits.
Concrete for foundations will be supplied by concrete production plants holding the attests for production of high-class concrete required by the Polish Standards. Estimated concrete consumption[1] for the purposes of foundations of the wind power plants and "Bięcino" MRP power station is approx. 10500 m^3.
In addition, it is estimated that construction of foundations of wind farm will consume approx. 14500 m^3 of aggregate (backfill and fill of the foundation) and approx. 1000 t of reinforcement steel.
Construction of roads and communication paths will require sand and break stone or other materials meeting the Polish Standards in quantity of approx. 12000 m^3.
Fuel and construction equipment transport at the construction stage will consume approx. 280 t of fuels (primarily diesel oil). Apart from fuel combustion, no other energy sources will be used for construction site servicing. At the construction stage, the source of power will be power generators.
At the exploitation stage, the staff of "Bięcino" wind farm and associated infrastructure will use primarily wind kinetic energy and small volumes of low and medium voltage power to supply own turbines, obstacle lighting and transformer stations and automation. The transformer station will be a facility requiring no permanent staff. Its operation, apart from power consumption, will require also water consumption from the water supply system or containers. Water is consumed only during stay of renovation or exploitation teams. Water demand for sanitary purposes does not exceed several dozen litres per week. Water will be supplied by the water mains or in the case of no option for connecting to the water supply system, by external companies. Heating of the station premises will be provided by electric storage heaters. Transformer station premises will be heated or cooled permanently to maintain optimal parameters of the equipment operation.
During exploitation, the wind farm will use no other raw materials and materials and fuels apart from consumables (greases, oils, friction materials, etc.).
At the decommissioning stage, operation of demolition equipment and transport will require fuel in volumes similar as at the construction stage (approx. 280 t of diesel oil). Water consumption for utility purposes at the decommissioning stage will be limited to approx. 5-6 dm^3/person/day. As at the construction stage, drinking water will be supplied in containers, whereas water for sanitary purposes will be supplied by the companies servicing mobile toilets.
Type and estimated volumes of substances or energy released to the environment with the use of environmental protection solutions
Wind farms operate on maintenance-free basis and require no construction of a standard social background facilities and water supply and sewage infrastructure.
The "Bięcino" wind farm will be the source of:

- noise emitted to the environment - emission of acoustic energy to the environment caused by rotor operation and rotation of blades of the power plants: planned wind power plants are the sources of high sound power that will cause periodic changes of acoustic climate at the vast area however not exceeding the permissible standards in the surroundings of places of permanent residence of people (see chapter 6.2.);
- low level infrasounds below the values that could affect human health (see chapter 7.2.9.);
- electromagnetic radiation emission (see chapter 7.2.10.);

[1] The values are estimated on the basis of the other similar investments delivered in Poland, to be specified at the stage of detailed design of the investment.

- waste production (see chapter 7.2.5.).

In addition, apart from supply of substances (waste) and energy emission (noise and infrasounds from the planned wind power plants), the "Bięcino" wind farm will cause:

- liquidation of soil cover and vegetation of agrocenoses at the construction stage (see chapters 7.1.1. and 7.1.7.);
- local reduction of stormwater infiltration to soil - water will flow down on the surface of foundations and road surface and be absorbed by soil in their direct vicinity (see chapter 7.2.2.)
- potential impact on birds and bats (see chapter 7.2.7.);
- impact on physiognomic values of landscape of the investment area and its surroundings (see chapter 7.2.11.);
- shadow flicker effect (see chapter 7.2.13.); .

No stroboscopic effect will occur thanks to application of specialist paints (see chapter 7.2.15).

All the aforementioned impacts will be of periodic nature (25 - 30 years of exploitation of the "Bięcino" wind farm) and will be reversible in most cases.

Operation of the "Bięcino" MRP MV/110 kV power station will cause production of small volumes of sanitary sewage during the stay of renovation or exploitation teams. Social background facilities within the planned transformer station (with water supply system connection) will be connected also to the sanitary sewage system. In the case of no such option, sewage will be discharged to the drainless reservoir and disposed to the sewage treatment plant. The alternative is to use mobile toilets serviced by a specialist sewage disposal company. Volume of produced sewage will be comparable with volume of consumed water i.e. several dozen litres per week.

2.2. Investment scenarios

Apart from the baseline scenario described in chapter 2.1., the following scenarios were analysed:

- **investment withdrawal scenario (no investment scenario);**
- **alternative scenario no. 1 differing from the baseline scenario with maximum sound power of the applied turbines of the planned wind power plants - up to 107 dB (up to 105 dB in baseline scenario);**
- **alternative scenario no. 2 differing from the baseline scenario with a number of planned wind power plants - 18 items (instead of 13 in baseline scenario).**

Investment withdrawal scenario

This scenario would be the most advantageous for the environment of the investment area and its direct surroundings, however also unadvantageous in terms of regional and global emission of energy pollutions to air and counteracting climate change (a conventional energy source would have to be built in the other location instead of a source of so called clean energy).

Withdrawal of the investment would have no impact on the local environment - it would remain intact. At the same time, no positive effects of the use of wind farm would take place. Use of wind farms contributes to reduced emission of pollutions to air, including greenhouse gases, and enables saving the restricted fossil fuels.

A conventional power plant supplied with hard coil releases to air 2.576 kg of sulphur dioxide (SO_2), 3.155 kg of nitrogen oxides (NO_X) and 0.22 kg of particulate matter [2], when producing 1 MWh of energy. It releases also large volumes of carbon dioxide (CO_2) responsible for global warming - approx. 833.58 kg.

[2] ENERGA S.A.: Information on the impact of power production on environment in terms of emission volume for individual fuels used for production of power sold by ENERGA - OBRÓT SA in 2010 (website: www.energa.pl).

- sulphur dioxide by approx. 36 kg;
- nitrogen oxides by approx. 45 kg;
- particulate matter by approx. 1.5 kg;
- carbon dioxide by approx. 5.8 tonnes.

The planned investment of the total nominal power up to approx. 39 MW for estimated capacity of approx. 20%, is the source of approx. 68300 MWh of power per annum, which means annual reduction of emission[3]:

- sulphur dioxide by approx. 170 tonnes;
- nitrogen oxides by approx. 212 tonnes;
- particulate matter by approx. 15 tonnes;
- carbon dioxide by approx. 54 tonnes.

Withdrawal from construction of the planned wind farm would be in contrary to the policy of air protection and counteracting climate change in global scale and energy policy of Poland (see chapter 2.3.), including the postulate of diversification of energy sources in Poland and increased consumption of renewable energy.

Alternative scenario no. 1

This scenario provides for location of 13 power plants (as in the baseline scenario), with application of turbines of maximum sound power of approx. 107 dB (the baseline scenario provides for location of turbines of sound power up to approx. 105 dB).

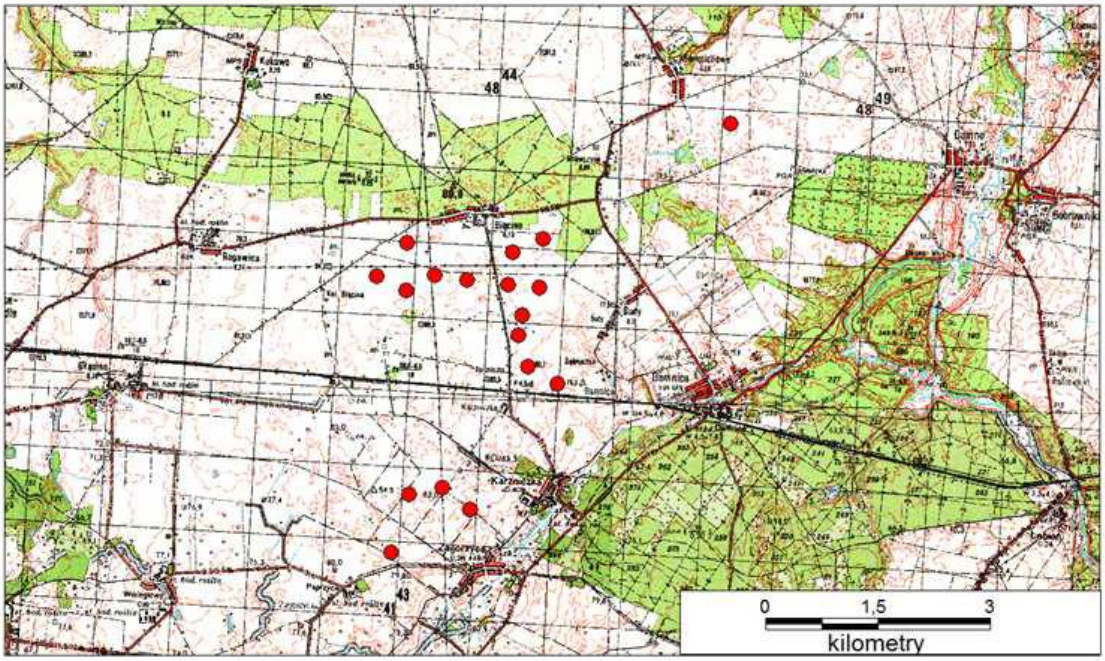
Alternative scenario no. 2

Initially, the "Bięcino" wind farm was to consist in 18 wind power plants (Fig. 2). Implementation of this scenario would require acquisition of the new areas for the investment (including for placement of power plants, assembly yards and construction of the new access road sections).

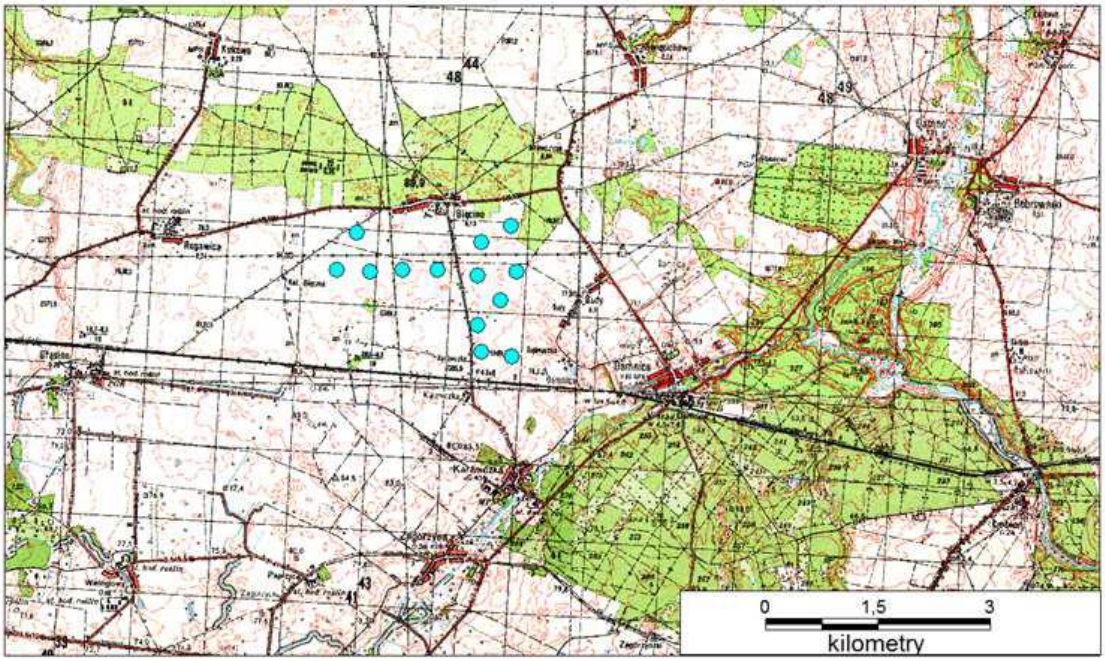
At further design stages, the environmental reasons (for the most projected impact on avifauna and chiropterofauna and from technical reasons) caused withdrawal from location of 5 wind power plants, reducing their number to 13 and modifying their positions (Fig. 3).

The environmental impact assessment of the investment scenarios is contained in chapter 6. of the "Report ...".

[3] Values estimated on the basis of data published by ENERGA SA.



Rys.2 Lokalizacja elektrowni wiatrowych "Bięcino" w wariancie alternatywnym - 18 szt.



Rys.3 Lokalizacja elektrowni wiatrowych "Bięcino" w wariancie podstawowym - 13 szt.

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kilometry	kilometres
Rys.2 Lokalizacja elektrowni wiatrowych "Bięcino" w wariancie alternatywnym - 18 szt.	Fig. 2 Location of the "Bięcino" wind power plants in alternative scenario - 18 items
kilometry	kilometres
Rys.3 Lokalizacja elektrowni wiatrowych "Bięcino" w wariancie podstawowym - 13 szt.	Fig. 3 Location of the "Bięcino" wind power plants in baseline scenario - 13 items
BIURO PROJEKTÓW I WDROŻEŃ PROEKOLOGICZNYCH	ECOLOGICAL DESIGN AND IMPLEMENTATION OFFICE
80-280 Gdańsk, ul. Szymanowskiego 2/12 tel./fax (058) 558-40-10 e-mail: proeko@proeko.gda.pl www.proeko.gda.pl	80-280 Gdansk, 2/12 Szymanowskiego Street, phone/fax (058) 558-40-10 e-mail: proeko@proeko.gda.pl www.proeko.gda.pl

2.3. Environmental protection solutions

Wind farms are a source of so called clean energy. Their use, thanks to replacing the conventional energy sources, contributes to reduced emission of CO_2, SO_2, NO_x and particulate matter to atmosphere, which brings advantageous environmental effects in local (reduced air pollution, better aero-sanitary conditions for human life) and global (reduced the climate and derivative effects of the greenhouse effect). The use of renewable energy sources complies with the sustainable development principles in force in Poland by way of Constitution and required by the international obligations of the country, primarily these resulting from its membership in the European Union and from ratification of the United Nations Framework Convention on Climate Change and so called the Kyoto Protocol by Poland.

In the "Bięcino" wind farm, the following environmental protection solutions shall be applied **at the construction stage:**

- location of wind power plants and transformer station:
  - in a distance from residential facilities (minimum distance of approx. 500 m) enabling elimination of impact of excessive noise level emitted by wind power plants on humans and impact of electromagnetic field from the transformer station;
  - at the agricultural lands with no significant environmental values, including outside the areas of birds and bats concentration (confirmed with the results of annual ornithological and chiropterological monitoring):
  - in line with the results of habitat and flora inventory and fauna monitoring (**Appendices 4 - 7**);
- maximum reduction of the construction site area;
- use of high-quality equipment, meeting the requirements for the machinery used outside the premises in terms of noise emission to the environment, in compliance with the Ordinance of the Minister of Economy of 15 February 2006 (Journal of Laws No. 32/2006, item 223) in the construction and assembly works;
- shutting down of machinery and equipment during breaks at work (avoiding idle running of machinery and equipment);
- use of construction "micro-machines" (specialist mini-excavators for digging narrow trenches for cable laying purposes, manual soil thickeners of 'foot' type) at the sections adjoining the environmentally valuable areas;
- selective collection of produced waste and their temporary storage until disposal at the landfill or other disposal;
- reception and utilisation of waste classified as hazardous waste (e.g. gear oils) by specialist services, in compliance with the conditions provided for in the Act on waste,
- protection of trees and shrubs presence in direct vicinity of the preformed works not intended for logging;
- maintaining the hydrographic conditions - prohibited backfilling of small water reservoirs and drainless basins,
- connecting the wind power plants with "Bięcino" MRP with MV underground cable and optic fibre in order to minimise impact on fauna, flora and landscape; the cable route should be delineated within agricultural lands, in a distance from forest areas and woodlots (in most cases within the routes of the existing roads),
- underground route of the MV line and optic fibre connecting the "Bięcino" MRP, delineation of its course within the routes of the existing roads.

Upon completion of the construction stage the area shall be restored to its original condition - enabling its previous use.

At the **exploitation stage** of the "Bięcino" wind farm, the following is planned:

- placement of wind power plants on cylindrical solid or segment walls, which in

contrary to the truss towers (or frame-strut towers) provide the birds with no nesting options and therefore do not attract them additionally in the vicinity of wind farms,
- use of technologically advanced turbines maximising the production capacity of power and at the same time reducing the potential environmental impact (noise emission),
- applying uniform and non-contrasting with the surroundings colour palette of the power plant structure in order to reduce impact on landscape,
- eliminating the stroboscopic effect by applying specialist paints covering the power plant structures;
- selective collection of produced waste and their temporary storage until disposal at the landfill or other disposal;
- reception and utilisation of waste classified as hazardous waste (e.g. gear oils) by specialist services, in compliance with the conditions provided for in the Act on waste,
- equipping the transformer station in oil sumps and systems of monitoring and separation of oil from storm waters in order to minimise the risk of leakage of transformer oil to the environment,
- connecting the wind power plants with "Bięcino" MRP with MV underground cable and optic fibre in order to minimise impact on fauna, flora and landscape; the cable route should be delineated within agricultural lands, in a distance from forest areas and woodlots (in most cases within the routes of the existing roads),

In addition, the "Bięcino" wind farm will be covered with:
- permanent technical supervision minimising the risk of failure of equipment (power plants and MRP station).
- acoustic monitoring in order to ensure compliance with the acoustic standards in force at the protected areas in direct vicinity of the wind farm. In the case of any potential excesses, the wind farms will be silenced (see chapter 12);
- post-implementation monitoring of birds and bats in order to determine actual bird mortality (if present) in effect of wind turbines operation (see chapter 12).

At the **decommissioning stage**, similarly as at the construction stage the following measures minimising the environmental impact will be applied:
- use of technologically advanced equipment in operating condition;
- use of equipment of low parameters of pollution and noise emission;
- maximum reduction of the demolition site area;
- selective collection of produced waste and their temporary storage until disposal at the landfill or other disposal;
- protection of trees and shrubs presence in direct vicinity of the preformed works not intended for logging;
- maintaining the hydrographic conditions - prohibited backfilling of small water reservoirs and drainless basins.
- use of high-quality equipment, meeting the requirements for the machinery used outside the premises in terms of noise emission to the environment, in compliance with the Ordinance of the Minister of Economy of 21 December 2005 as amended (Journal of Laws of 2005, No. 263, item 2202, Journal of Laws of 2006, No. 32, item 223 and Journal of Laws of 2007, No. 105, item 718) in the demolition and transport works;
- shutting down of machinery and equipment during breaks at work (avoiding idle running of machinery and equipment);
- selective collection of produced waste and their temporary storage until disposal at the landfill or other disposal;
- reception and utilisation of waste classified as hazardous waste (e.g. gear oils) by

specialist services, in compliance with the conditions provided for in the Act on waste,

Upon completion of the decommissioning stage of the "Bięcino" wind farm, the area of the investment will be recultivated and adjusted to the previous agricultural use.

2.4. Land use conditions at the investment construction and exploitation stages

Under the planned investment, the construction stage will be initiated with construction roads to the individual power plants (i.e. levelling, supply of material and forming the road profile). This process can partially apply to the existing roads that will be temporarily withdrawn from exploitation. Upon completion of road constructions, these will be permitted for general use.

This will be followed by levelling of the areas for locations of the power plants and assembly years as well as excavations for foundations of the wind power plants. The next stage of works will consists in placing the foundations and, upon their setting (hardening), installation of the core power plant structure.

The areas covered with earthworks and assembly works will be withdrawn from agricultural use for the period of performance of these works.

Upon completion of the assembly works, the areas around the power plant will be recultivated and restored for agricultural use. Only the areas of placement of foundations of the power plant and corresponding access roads shall be excluded from agricultural use on permanent basis.

The initial use will be restored for all areas of location of MV power cables and optic fibre cables.

The "Bięcino" wind farm will be located on the area covered by the "Local Spatial Development Plan in the Damnica Commune in the Bięcino and Karżniczka precincts" adopted by the Resolution No. XLVIII/331/10 of the Damnica Commune Council on 21 April 2010 - Appendix 2.

As stated in the "Plan":

1. *For the areas marked on the drawing of the local spatial development plan with symbols 1EW-13EW, the following intended use is established - areas of wind power plants with technical equipment and associated infrastructure.*
2. *On the areas referred to in paragraph 1, the hardened area should be 4800 m^2 at the latest - including the area of service roads and yards, with mandatory leaving of the remaining area as agricultural lands.*
3. *On the areas referred to in paragraph 1, location of surface and underground grids and equipment of power infrastructure as well as yards and internal roads related to exploitation of the wind farm is permitted.*
4. *The final, detailed location of the wind power plants, internal and service roads and yards related to exploitation of the wind farm shall be provided in the draft land development plant at the construction design stage.*
5. *The height of the wind power plant, referred to in paragraph 1 shall be specified as:*
   1) *not higher than 120 metres ± 5% - for tower construction;*
   2) *not higher than 170 metres ± 5% - for the top position of the rotor blades (in maximum deflection).*
6. *The facilities of wind power plants shall be mandatory delivered in uniform colour palette, in white or light grey colour or in colours neutral for the landscape: light, pastel or matt.*
7. *The following is established:*

1) *prohibition of placing the billboards on the power plant structure, excluding the symbol of manufacturer and/or investor;*
2) *obligation of lightning protection; protection against emission of electromagnetic waves and electric shock;*

3) *obligation of equipping the wind power plants in obstacle signs in compliance with the provisions concerning marking of aviation obstacles;*
4) *prohibition of use of lighting of wind power plant towers causing excessive background lighting, reducing light range of navigation signs and similar to navigation signs.*

The design of the "Bięcino" win farm is compliant with the provisions of the aforementioned local spatial development plan.

3. STRUCTURE AND ANTHROPIZATION OF NATURAL ENVIRONMENT IN THE LOCATION OF THE INVESTMENT

3.1. Location in the region

The area of the investment is situated in the Damnica Commune, in the central part of the Słupsk Poviat, at the north-western border of the Pomeranian Voivodeship.
In terms of division into physico-geographical regions (according to Kondracki, 1998), the location of the investment lies the range of the Damnicka Upland. This mesoregion is included into the macroregion of Koszalińskie Maritime Region classified into the subprovinces of the South Baltic Maritime Regions.
The Damnicka Upland constitutes the physico-geographical mesoregion within the Koszalińskie Maritime Region. From west, it is delimited from the Sławieńska Plain with the Słupia River Valley, from east - from the Żarnowiecka Upland with the Łeba River Valley (Reda-Łeba River Ice-Marginal Valley), from north - with Słowińskie Coast and is transformed into Polanowska Upland on the south.
Topography is undulated, with average height of 70 m above sea level. The Łupawa River crosses the central area of the Damnicka Upland. The Damnicka Upland mesoregion adjoins Sławieńska Plain from the west, with Reda-Łeba River Ice-Marginal Valley from the west, with Słowińskie Coast from north and with Polanowska Upland from the south.

3.2. Structure of natural environment of the location of the "Bięcino" wind farm and its surroundings

3.2.1. Topography, geological structure and soils

The location of the investment is situated entirely within the plateau of the ground moraine upland. Topography in the investment area is hardly diversified and without significant height differences. Only in the south-eastern part of the investment area (in a distance of approx. 400 m from the nearest planned wind power plant) topography is diversified with a small moraine trough with distinct slopes.
Ordinates within the location of the investment range between approx. 80 m above sea level in the south-eastern part of the investment area and approx. 85 m above sea level in its central part. The surface area generally declines towards south and to the Charstnica River Valley (the river crosses in a distance of approx. 1.4 km from the nearest planned wind power plant).
The geological structure of the location of the investment is composed primarily of glacial accumulation formations - boulder clays, glacial and fluvioglacial sands and gravels, proglacial clays and silts as well as interglacial river and lake sediments in a form of sands, gravels, silts, clays and peats. Thickness of Pleistocene sediments is diversified which results from various strength of glacial accumulation and presence of unevenness in the sub-quaternary surface. The surface area is covered with boulder clay of thickness between several and several dozen meters. Holocene sediments formed after rebound of continental glacier continuing to form are represented by deluvial formations at the foot of the inclines.
Soils
Soil cover has been formed on quaternary formations based on Pleistocene glacial and fluvioglacial sediments (primarily boulder clays and sands) and - to the lesser degree - from Holocene sediments (primarily peats and silty and peat formations). Acidic and leached brown soils formed of light clays and light silty clays, partially sandy, to heavy clay sands, usually highly acidic, are dominating. IIIa, IIIb and IVa class soils prevail.
The depressions and basins are dominated by hydrogenic soils. These are peat and

muck soils and used as grasslands. Grasslands are in turn dominated by meadows and medium-fertile pastures of artificially regulated hydrographic conditions. Part of them is periodically highly watered or dried.

3.2.2. Hydrographic conditions

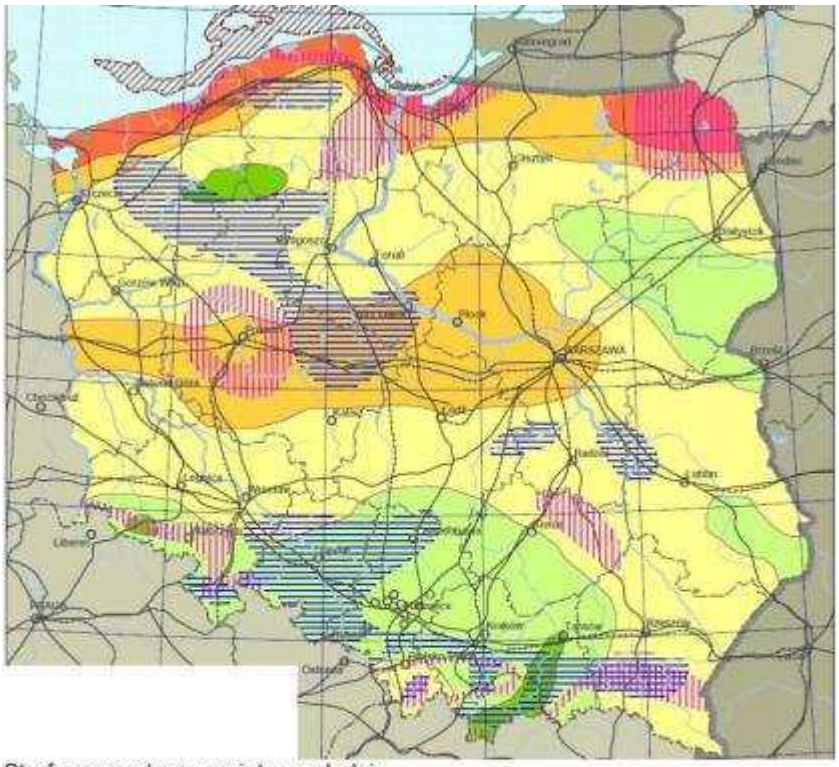
The area of the location of the "Bięcino" wind farm is situated entirely in the catchment basin of the Łupawa River that debouches to the Baltic Sea.
There are no watercourses, drainage ditches and water reservoirs in the location of the wind power plants (see cartographic appendix). The Charstnica river being a tributary of the Łupawa River that debouches to the Baltic Sea crosses the area towards south-east from the location of the power plant in a distance of approx. 1400 m.
The source area of Charstnica River is situated towards south from the road section: Soborze - Mianowicew in a distance of approx. 4.5 km towards south from the location of wind power plants. The Charstnica River crosses the following localities: Zagórzyca, Karzniczka, Damnica and debouches to the Łupawa River towards north-east from this locality. Total catchment basin of this river, practically entirely situated within the commune, is 46.6 km^2. The prevailing part of the catchment basin is of agricultural nature. The Charstnica River constitutes the largest left-side tributary of Łupawa.
Apart from Charstnica River, surface waters in the surroundings of the location of the investment are represented by wetlands and minor water reservoirs - so called water holes (see cartographic appendix).
Surface waters within the area of the investment are administered by the Regional Water Management Board in Gdansk.

Groundwaters

There are four water-bearing strata within the quaternary formations - ground, upper inter-clay, middle inter-clay and under-clay (bottom inter-clay) stratum.
The first groundwater level is located on differentiated depths within the moraine upland - predominantly at the depths below 4 m below ground level, frequently several meters below ground level. In sandy and gravel interbeddings, this level can have a form of inter-clay filtrations (waters of perched water table forming no continuous level).
Pursuant to the "Environmental impact assessment to the draft local spatial development plan in the Damnica Commune in the Bięcino and Karżniczka precincts" (2010)
In vast majority of the area, groundwaters reach the level of 5-10 m below ground level. At the bottom of the Charstnica and Łupawa River Valleys, in the valley section along the watercourses running from Dąbrówka and Bobrowniki and also in the basins along the remaining watercourses, the level rises up to 2-5 m and locally to 0-2 m below ground level. At the areas inclined against the surroundings, the southern inclines, border upland areas along the Łupawa and Charstnica River Valleys, the groundwater level reaches 5-20 m. The main utility water-bearing stratum of the Słupsko-Chojnicki Region precinct, Słupski Sub-Region, is related to quaternary formations and lies at the depths of several dozen meters below ground level. Locally, the basins of sub-quaternary surfaces can display the lower-quaternary level of approx. 20 m thickness underlying the inter-moraine upper-quaternary level of thickness not exceeding 15 and in the form of patches or pockets. Tertiary water-bearing level occurs and is used sporadically (Bięcino, Damno, Strzyżno).
The "Bięcino" wind farm is situated outside the range of the delineated Main Groundwater Reservoirs (MGR). The nearest reservoir of such type is the MGR No. 115 Łupawa", located in a distance of approx. 6.5 km from the area of the investment.

3.2.3. Climate

Climate conditions of the area result from its location in the Mid-Coastal Region (Woś 1999).
This region covers the middle part of the Słowińskie Maritime Region. It has a distinct southern border indicating significant differences in climate conditions dominating in this region and on the areas situated towards south. Comparing to the other regions, it is distinguished with a relatively highest number of days with moderately warm weather. There are more than 153 such days a year in average.
Pursuant to the "Environmental impact assessment to the draft local spatial development plan in the Damnica Commune in the Bięcino and Karżniczka precincts" (2010):
Vegetation period length ranges between 200 and 208 days. Annual total precipitations are around 600 mm and their spatial distribution depends primarily from slope exposure. Rare storms and hailstorms need to be noticed. The Pomeranian District (IV) is relatively colder. Winter is longer than in the Western Baltic District (by 10-12 days in average). Vegetation period hardly reaches 200 days. Snow cover maintains for up to 75 days. This district is specific for a relatively high number of days with strong wind. The specific feature of this district is also shorter - comparing to the previously described - period of transition seasons of the year (spring, autumn).
The basis for assessment of precipitation conditions within the commune is data from the precipitation measuring station of the Institute of Meteorology and Water Management in Malczków, at the height of 73 m above sea level. Data from this measuring station form the basis for determination of precipitation conditions covering the multi-annual period of 1971 - 2000. Calculated average annual precipitation for the measuring station in Malczków is 731 mm. Maximum total precipitation comparing to average precipitation value from the multi-annual period in Malczków reaches 164% in wet year and constitutes 53% of its value in the dry year. In annual breakdown of average monthly total precipitations, Malczków observed a clear advantage of summer half-year (V-X) - 402 mm over the winter half-year (IX-IV) - 329 mm. The highest monthly total precipitations are recorded in September - 75 mm as well as in October and June - 68 mm, whereas the lowest in April - 42 mm.
The area of the investment is situated in a region of highly favourable wind conditions and for location of wind farms in Poland (Fig. 4).



Strefy energetyczne wiatru na lądzie
(według H. Lorenc / IMiGW, na podstawie okresu obserwacyjnego 1971-2000)

I - wybitnie korzystna
II - bardzo korzystna
III - korzystna
IV - mało korzystna
V - niekorzystna
obszary na morzu korzystne dla rozwoju energii wiatrowej

Obszary o częstości występowania wiatrów
(według T. Niedźwiedzia, J. Paszyńskiego i D. Czekierdy, 1994)

średnio powyżej 40 dni rocznie z wiatrem silnym (10 m/s i więcej)
średnia roczna częstość ciszy i słabego wiatru (2 m/s i mniej) powyżej 60%

- lokalizacja zespołu elektrowni wiatrowych „Bięcino"

Strefy energetyczne wiatru na lądzie (według H. Lorenc / IMiGW, na podstawie okresu obserwacyjnego 1971 - 2000)	Onshore wind power zones (according to H. Lorenc / Institute of Meteorology and Water Management, on the basis of observation period of 1971 - 2000)
I - wybitnie korzystna	I - extremely advantageous
II - bardzo korzystna	II - highly advantageous
III - korzystna	III - advantageous
IV - mało korzystna	IV - hardly advantageous
V - niekorzystna	V - unadvantageous
obszary na morzu korzystne dla rozwoju energii wiatrowej	off-shore areas advantageous for wind energy development
Obszary o częstości występowania wiatrów (według T. Niedźwiedzia, J. Paszyńskiego i D. Czekierdy, 1994)	Areas with frequency of wind occurrence (according to T. Niedźwiedź, J. Paszyński andi D. Czekierda, 1994)
średnio powyżej 40 dni rocznie z wiatrem silnym (10 m/s i więcej)	averagely above 40 days a year with strong wind (10 m/s and more)

średnia roczna częstość ciszy i słabego wiatru (2 m/s i mniej) powyżej 60%	average annual frequency of stillness and weak wind (2 m/s and less) above 60%
- lokalizacja zespołu elektrowni wiatrowych „Bięcino”	- location of the "Bięcino" wind farm

Fig. 4 Location of the "Bięcino" wind farm against the "Map - renewable energy resources in Poland - wind energy"
Source: National spatial development concept 2030 (2012).

3.2.4. Vegetation and habitats

The report from the inventory of natural habitats and flora performed in July 2012 is included in the "Environmental inventory report for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune" (Haplicznik, Kaszewska-Mejer, Jaśkiewicz and Szmigiel 2012) - Appendix 4.
Pursuant to this study:

Methodology

The flora inventory of the area was performed in July 2012. Field studies were performed using the route method and aimed at field identification of:

- *habitats and sites of plants listed in Annex II to the Habitats Directive and legally protected under the Ordinance of the Minister of Environment of 5 January 2012 on the plant species protection (Journal of Laws of 2012 No. 0, item 81).*
- *natural habitats listed in Annex I to the Habitats Directive, pursuant to the Act on nature conservation of 16 May 2004 and Ordinance of the Minister of Environment of 13 April 2010 on natural habitats and species of Community interest as well as the selection criteria for the areas eligible for Natura 2000 status. (Journal of Laws No. 77 item 510).*

To identify the individual species, the identification keys for species determination were used (Rutkowski 2007; Szafer et al. 1986; Rothmaler 2009). Taxon nomenclature was based on the Critical list of vascular plants of Poland (Mirek at al. 2002). Habitats and their plant communities were identified on the basis of identification key for plant community determination (Matuszkiewicz 2008) and "Guides for habitat and Natura 2000 species protection" (Herbich 2004 a,b,c).
In the case of identification of lichens: vast majority of species is determined on-site, in particular protected species; samples can be subject to laboratory analysis. The laboratory works apply the morphological, anatomic and chemotaxonomic analysis methods, using the stereoscopic and light microscopes. In chemotaxonomic methods, the used reagents include: calcium hypochlorite water solution, Lugol's iodine, potassium hydrochloride water solution and paraphenylenediamine solution in ethyl alcohol. The material is determined using the identification key of J. Nowak and Z. Tobolewski (1975), studies by O.W. Purvis et al. (1992), and V. Wirth (1995). Species protection status is provided according to the Ordinance of the Minister of Environment of 9 July 2004 on species of the protected wild fungi (Journal of Laws 04.168.1765 of 28 July 2004).

Inventory results

Location of the Bięcino wind farm is planned at the areas of agricultural lands crossed with roads with spruce and ash lanes.

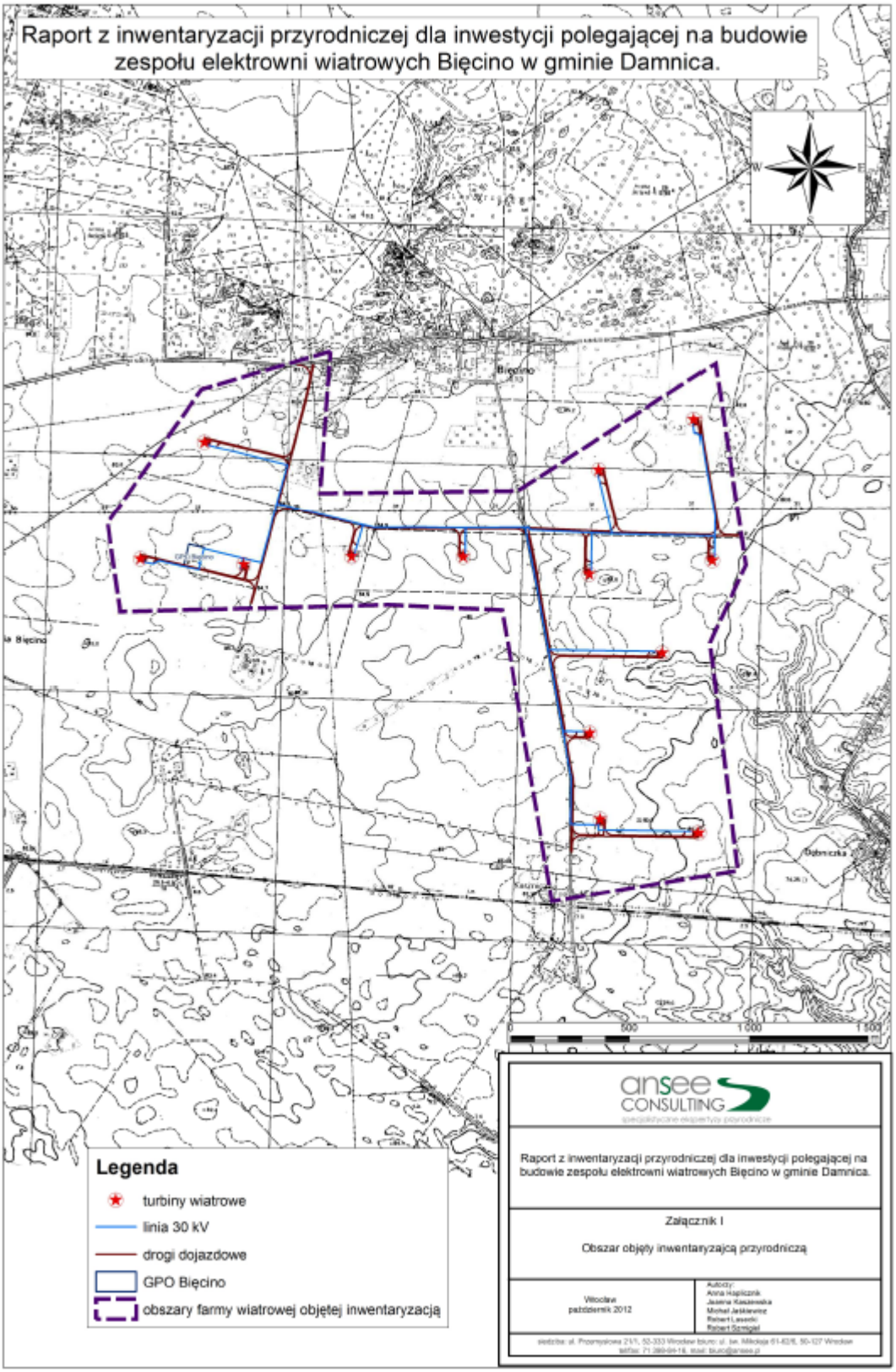
Flora, fungi and lichen species

During the field inventory, neither flora species listed in Annex II to the Habitats Directive nor species protected under the national law or rare or endangered species in regional and national scale were identified. At the area of the planned Bięcino wind farm no protected fungi and lichen species were identified.

Natural habitats

No natural habitats requiring protection under the Natura 2000 sites were identified

within the inventoried area.



Raport z inwentaryzacji przyrodniczej dla inwestycji polegającej na budowie zespołu elektrowni wiatrowych Bięcino w gminie Damnica.	Environmental inventory report for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune.
Legenda	Legend
turbiny wiatrowe	wind turbines
linia 30 kV	30 kV line
drogi dojazdowe	access roads
GPO Bięcino	Bięcino MRP
obszary farmy wiatrowej objętej inwentaryzacją	inventoried wind farm areas
Raport z inwentaryzacji przyrodniczej dla inwestycji polegającej na budowie zespołu elektrowni wiatrowych Bięcino w gminie Damnica.	Environmental inventory report for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune.

Załącznik I	Appendix I
Wrocław	Wroclaw
październik 2012	October 2012
Obszar objęty inwentaryzajcą przyrodniczą	Area covered with environmental inventory
Autorzy:	Authors:
Anna Haplicznik	Anna Haplicznik
Joanna Kaszewska	Joanna Kaszewska
Michał Jaśkiewicz	Michał Jaśkiewicz
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Fig. 5 Area covered with inventory of habitats, flora, fauna (excluding insects, birds and bats, Haplicznik, Kaszewska-Mejer, Jaśkiewicz and Szmigiel 2012) - **Appendix 4**

Complete text of flora and habitat inventory by Haplicznik, Kaszewska-Mejer, Jaśkiewicz and Szmigiel (2012) is contained in Appendix 4 constituting the integral part of This "Report...".

3.2.5. Fauna

3.2.5.1 Fauna inventory (excluding birds, bats and insects)

Report from the performed habitat, flora and fauna inventory (excluding birds, bats and insects) is included in the "Environmental inventory report for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune" (Haplicznik, Kaszewska-Mejer, Jaśkiewicz and Szmigiel 2012) - Appendix 4.
Pursuant to this study:

Mammals

Methodology

The adopted key mammal inventory method consists in field tracking the presence traces (e.g. excrements, feeding traces, dead animals) and evening and night monitoring. No catches of small insectivorous mammals were performed. The focus was on identification of habitats of potential importance for this group of animals. Part for traces was non-identifiable.

Identified mammal species

At the inventoried area, no species of mammals protected under the national law and listed in Annex II to the Habitats Directive were identified.

Potential mammal presence

At the area of the planned investment, the following species may be potentially present:

- *European hedgehog Erinaceus europaeus*
- *weasel Mustela nivalis*

Important mammal habitats

At the inventoried area, no important habitats of the protected mammals were identified.

(...)

Amphibians

Methodology

Field studies of the amphibians were limited to their observation in natural environment, control of facilities potentially inhabited by the amphibians and night monitoring. No catches were performed. The focus was on necessary protection of habitats and reducing the number of any amphibians falling into the excavations to minimum.

In the case of no possibility of classification of brown frogs with high level of certainty by their appearance and habit, the observed animals, in particular adolescent, were classified as common frog Rana temporaria. Green frogs difficult to identify or without distinct habitat features were described as green frog complex Rana esculenta complex.

Due to the period of field studies, some species were identified only potentially on the basis of habitats.

The areas of potential numerous occurrence of amphibians or differentiated water habitats constituting important breeding or feeding areas in the later periods of amphibian life cycle were delineated as habitats of importance for amphibians.

Identified amphibian species

No amphibian species were identified at the inventoried area.

Potential amphibian presence

The amphibian species of the highest occurrence probability rate within the investment area include:

- *common toad Bufo bufo*
- *common spadefoot Pelobates fuscus*

Important amphibian habitats

At the area of the planned wind farm no facilities constituting or potentially constituting the breeding or feeding areas of importance for amphibians.

Reptiles

Methodology

The inventory included the inspection of habitats of potential importance for reptiles. In the later period of the inventory the weather has changed which effected in reduced detection of basking reptiles. In order to avoid destruction of the reptile habitats, no shelters under the stones, branch piles and limbs were checked.

Not all observed lizards could be classified as species with high level of certainty, vast majority of animals observed in the environment have rapidly run for cover preventing thorough observation. In such cases, at dry habitats these were classified as sand lizards.

Identified reptile species

No reptile species were identified at the inventoried area.

Potential reptile presence

The reptiles potentially occurring within the investment area include:

- *sand lizard Lacerta agilis.*

Important reptile habitats

Within the planned investment no sites of potential importance for reptiles were identified.

Complete text of fauna inventory (excluding insects, birds and bats) by Haplicznik, Kaszewska-Mejer, Jaśkiewicz and Szmigiel (2012) is contained in Appendix 4 constituting the integral part of this "Report...".

3.2.5.2 Entomofauna inventory

The report from the entomofauna inventory performed in July 2012 is included in the "Report from entomofauna inventory for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune" (Haplicznik, Lasecki, Szmigiel 2012) - **Appendix 5**.

Pursuant to this study:

Methodology

Field works within the entomological inventory were performed in July 2012. The Barber traps were installed on surfaces intended for wind turbines and controlled on everyday basis.

Field observations were performed within the borders of the areas intended for wind turbines. The studies included these orders of insects, among which the species protected under the Act of 16 April 2004 on nature conservation (Journal of Laws of 2009, No. 151, item 1220, as amended) and under the implementing acts (with particular focus on the species from the Habitats Directive) were distinguished.

(...)

The study methodology adopted for the individual orders of inventoried insect is presented below.

A. Odonates - Odonata

The material was collected using the entomological net or directly with hand. Caught odonates were identified on site with the use of identification key for odonates in Poland available on the website: www.odonata.pl. No species subject to species protection or rare species were recorded among the observed odonate species.

B. Beetles - Coleoptera

Due to the period of inventory and with simultaneous consideration to geographical distribution and habitat preferences of the individual protected beetle species, the field works focused on the five beetle families:

- Scarabs - Scarabaeidae
- Water scavenger beetles - Hydrophilidae
- Predaceous diving beetles - Dytiscidae
- Ground beetles - Carabidae

The methodology of material collection differed significantly for the individual beetle families.

In the case of scarabs family to which 2 protected species belong - Osmoderma eremita (Scopoli, 1763) and Protaetia aeruginosa (Drury, 1770), the area of the investment was controlled with a view to presence of habitats enabling development of these species (trees with punk wood or with tree holes) with particular focus on tree lanes along the roads. No presence of any of the aforementioned beetles was recorded at the area of the investment. Presence of Osmoderma eremita is highly probable in the locations indicated on the enclosed maps. With regard to water scavenger beetles and predaceous diving beetles, the material for analysis was collected with hydrobiological bucket, placed in white cuvette with water and the individuals from these families were selected. Due to unadvantageous weather conditions during the inventory no attempts of night catching using the light method were taken. No protected species from the aforementioned families were recorded during the field works.

The method of material collection for analytic purposes for ground and rove beetles consisted in placing the ground traps - so called Barber traps. The Barber trap is a small container (usually 0.3 -0.4 l) dug in the ground in a way that its upper edge does not stick out above the ground level (soil). In most cases such traps are controlled in larger time intervals and in order to preserve the collected material these are filled with e.g. ethylene glycol. For the purposes of this inventory, the modified ground traps were installed (at the half-depth of the trap a metal net with 5 mm mesh is placed in order to prevent escape of the protected Carabus and Calosoma species). The traps were installed in 3 types of environment: forest areas (divided into forests and forest stands), areas highly transformed by human activity and unused (wastelands, fallow lands, ruderal areas, etc.), agricultural areas (divided into arable lands and meadows and pastures). No presence of protected ground beetles species - Carabidae were identified in the inventoried area.

C. Butterflies - Lepidoptera and Hymenoptera

In order to perform inventory of butterflies at the area of the planned investment, the controls on the wind turbine areas were carried out. No presence of butterflies and their potential habitats were identified in the inventoried area.

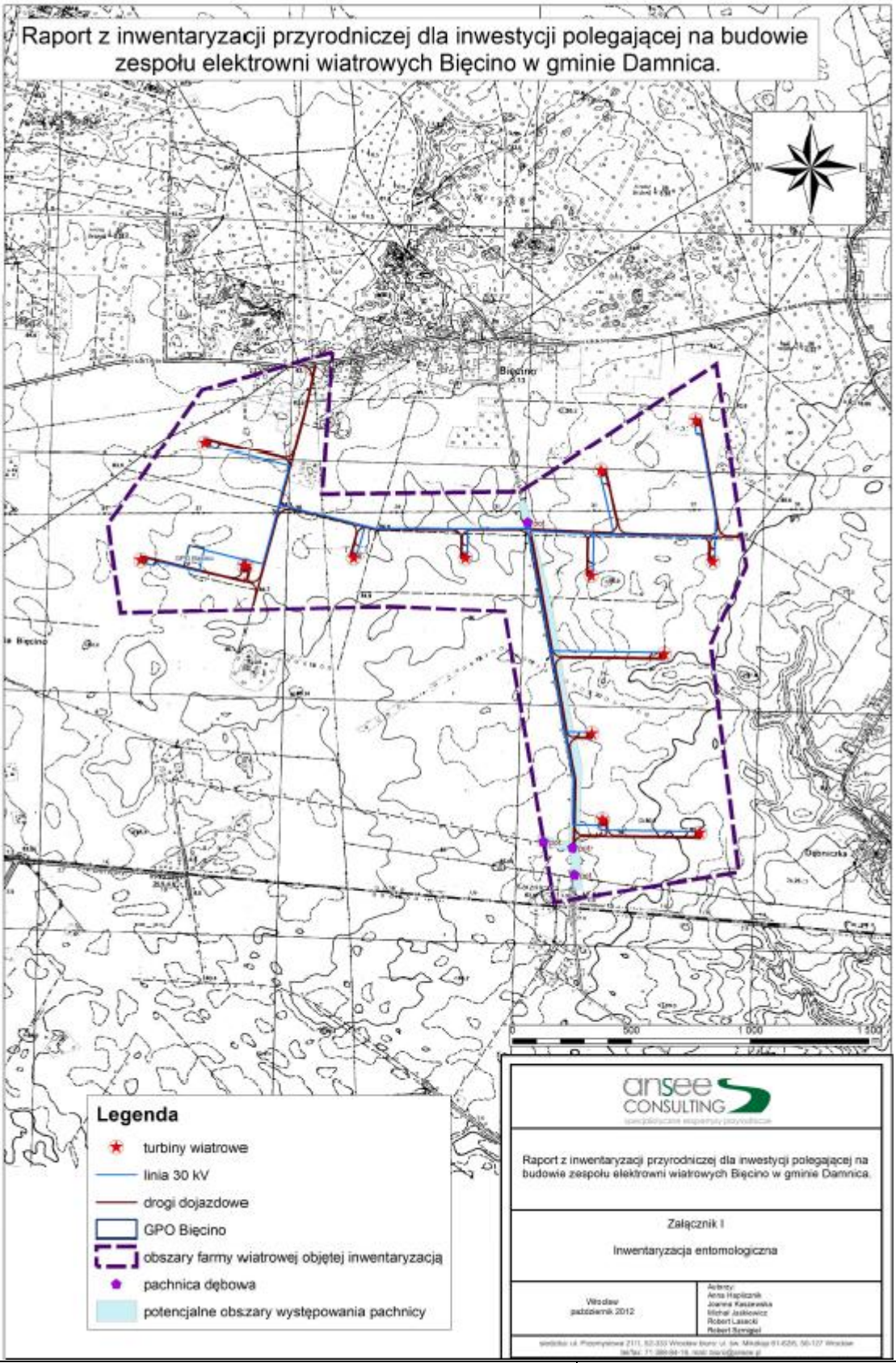
Since the inventoried area contains no helocrenic springs being the habitat of the only protected caddis fly species in Poland - Crunoecia irrorata (Curtis, 1834), as well as individuals of this species, it was not considered further in this study.

Inventory results

The performed inventory demonstrated the probable presence of a single species of a protected insect - Osmoderma eremita (Scopoli, 1763)

Osmoderma eremita is the species listed in Annex II to the Council Directive 92/43/EEC. As for the beetles associated with punk wood within the tree holes, the presence of the potential habitats for this species were identified in 3 locations in the inventoried area. In the region, this species is uncommon.

Pełny tekst inwentaryzacji owadów autorstwa Haplicznik, Laseckiego i , Szmigela (2012) zawiera Appendix 4, stanowiący integralną część niniejszego „Raportu.".



Raport z inwentaryzacji przyrodniczej dla inwestycji polegającej na budowie zespołu elektrowni wiatrowych Bięcino w gminie Damnica.	Environmental inventory report for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune.
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GPO Bięcino	Bięcino MRP
obszary farmy wiatrowej objętej inwentaryzacją	inventoried wind farm areas
pachnica dębowa	Osmoderma eremita
potencjalne obszary występowania pachnicy	Potential areas of presence of Osmoderma eremita

Raport z inwentaryzacji przyrodniczej dla inwestycji polegającej na budowie zespołu elektrowni wiatrowych Bięcino w gminie Damnica.	Environmental inventory report for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune.
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Fig. 6 Area subject to entomofauna inventory (Haplicznik, Lasecki, Szmigiel 2012) - **Appendix 5**

3.2.5.3 Ornithological monitoring

Report from the ornithological monitoring performed between May 2009 and end of April 2010 is included in the "Report from avifauna monitoring of the "Bięcino" Wind Farm" (Antczak 2010) - **Appendix 6**.

Pursuant to the aforementioned report (Antczak 2010):

At the territory of "BIĘCINO" (area: approx. 5 km^2) 3 points located in the places enabling observation of the entire area were delineated. In addition, transect lines of the total length of 7900 m were delineated (fig. 1). Technique and order of the individual study modules differed for the individual phenological periods:

- *in the breeding period (May - first half of July), the bird periods started n the transects. Upon their completion, the observations were relocated to the observation points. Observation period in the points was about 2-3 hours comparing to 3-4 hours for transects.*
- *in the spring migration period (March - April) and autumn migration period (September - October) and in the period of post-breeding dispersal (July - August) the observations were carried out in the observation points. Observation period was 5 hours;*
- *in the winter season, the controls consisted in walking through the entire area at the transect lines and additional control from the off-road vehicle of all area from the borderline roads. Time period of the effective observations was approx. 3 periods in this season.*

The controls started at morning, usually not later than in 1-3 hours from sunrise. Total number of the performed standard controls was 30 - effective time period of point and transect observations exceeded 160 hours. In addition, for auxiliary studies - night counts, searching for breeding sites of the large species outside the investment area and additional penetration of the area from vehicle after each control - more than 30 hours of observations were allocated (...).

MONITORING RESULTS

Biodiversity

During the studies performed at the area of the planned wind farm and in its direct vicinity, the total of 85 bird species (37 Nonpasseriformes - non-passerine and 48 Passeriformes - passerine) were identified. Due to inability of identification of the observed birds at the species level, the genus taxon - goose - was applied (Anser sp.). Among all species, in annual scale 43 species were recorded rarely (1-4 observations; attendance - below 15%), 21 species were observed irregularly (5-9 observations; attendance of 16.7-30.0%) and the remaining 22 species were recorded regularly (10-29 observations; attendance - above 30%).

Vast majority of the regularly recorded bird species included common and non-endangered birds. The most frequently recorded species included: raven, buzzard, bunting, meadowlark, blue tit, ringdove, lark, jay, blackbird and starling with attendance over 70%). In the group of regularly recorded species, all were a permanent and specific for the central part of Pomerania component of agricultural landscape along with forest and tree stand borderline areas. Among the rare species one should notice whooper and whistling swan as well as Canada geese. Abundance of these species was however minor. Canada goose is an alien species increasingly frequently recorded in our country in different times of the year and from several years even nesting in a few places (in Gdansk and at the Somińskie Lake). This species is now turning potentially invasive and in longer time perspective posing a threat to the native fauna (...).

There are 71 species subject to species protection, partial protection - 8 species (Canada goose, grey heron, cormorant, herring gull, magpie, hooded crow, rook and

raven) and hunting protection - 6 species bean goose, white-fronted goose, greylag goose, mallard, partridge and ringdove) (....).

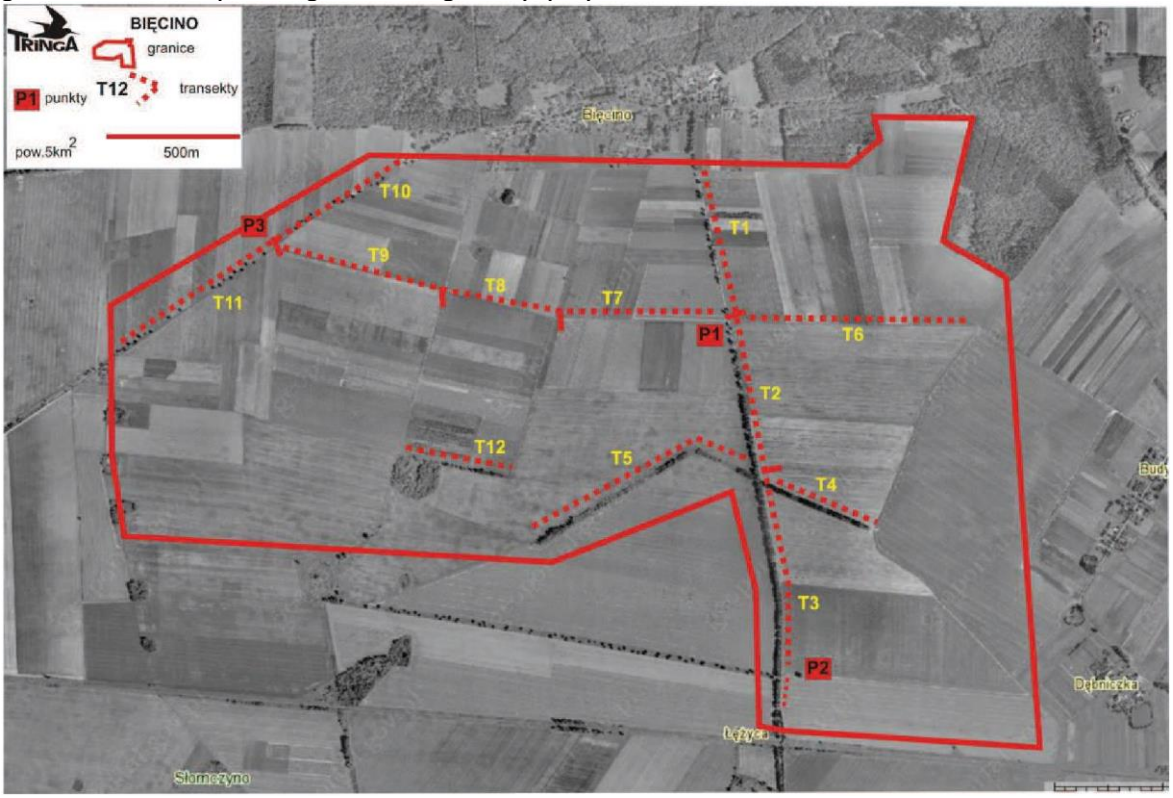


Fig. 7 Transects and ornithological monitoring points (Antczak, 2010)

BIĘCINO	BIĘCINO
granice	borders
punkty	points
transekty	transects
pow. 5km^2	area of 5 km^2
500m	500 m

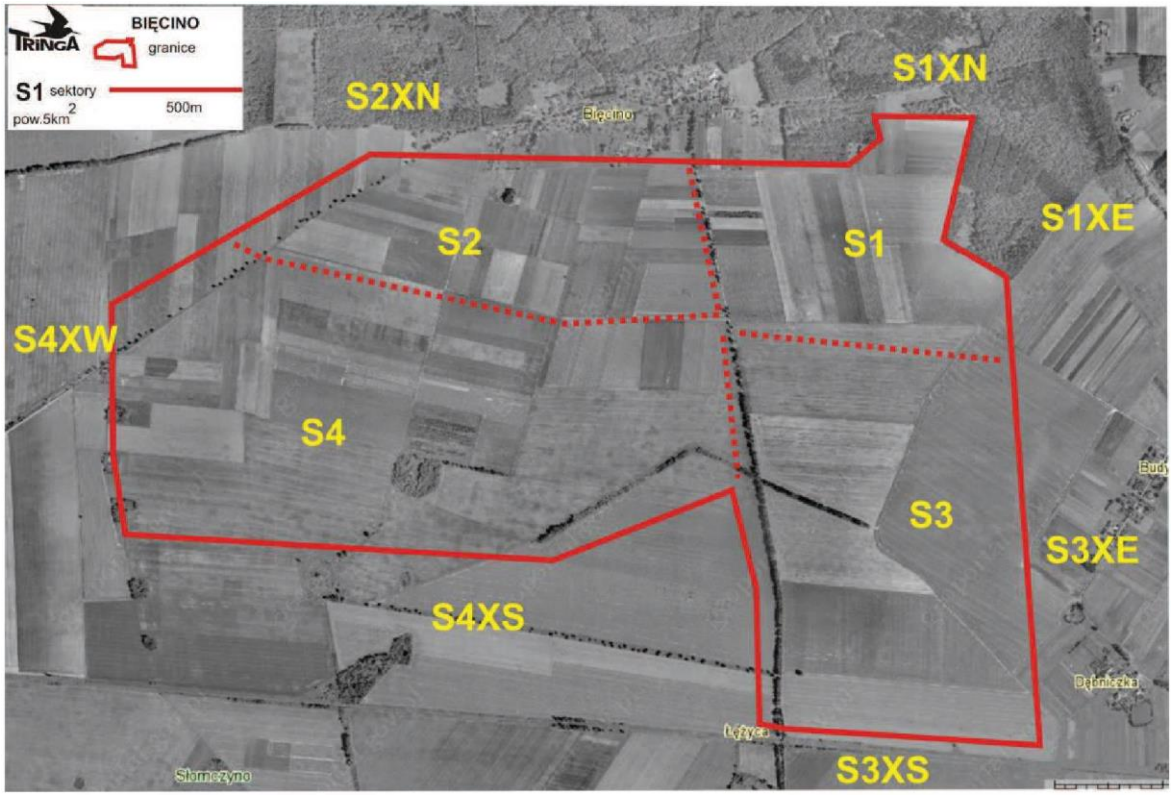


Fig. 8 Ornithological monitoring sectors (Antczak, 2010)

BIĘCINO	BIĘCINO
granice	borders
sektory	sectors
pow. 5km^2	area of 5 km^2
500m	500 m

Table 2. Bird species observed in the annual ornithological monitoring period at the area of "Bięcino".
Legend: Area status: B - breeding within the area; BX - breeding in the neighbourhood; BoP - bird of passage or flying-by bird; Protection status: SPEP - species protection; HUNTINGP - hunting protection; PARTIALP - partial protection; Annex 1 BD species listed in Annex I to the Birds Directive; PRDBA - species listed in the Polish Red Data Book of Animals; * - breeding sites in a distance of more than 2 km from the wind farm border.

No.	SPECIES	Area status	Protection Status	Annext I BD	PRDBA
1	mute swan	BoP	SPECIESP		
2	whistling swan	BoP	SPECIESP	1	
3	whooper swan	BoP	SPECIESP	1	
4	bean goose	BoP	HUNTINGP		
5	white-fronted goose	BoP	HUNTINGP		
6	greylag goose	BoP	HUNTINGP		
7	Canada goose	BoP	PARTIALP		
8	widgeon	BoP	SPECIESP		CR
9	mallard	B	HUNTINGP		
10	partridge	B	HUNTINGP		
11	quail	B	SPECIESP		
12	cormorant	BoP	PARTIALP		
15	grey heron	BoP	PARTIALP		
16	white stork	BX	SPECIESP	1	
15	red kite	BoP	SPECIESP	1	NT
16	marsh harrier	BX	SPECIESP	1	
17	Montagu's harrier	BoP	SPECIESP	1	
16	hawk	BoP	SPECIESP		
19	sparrowhawk	BX	SPECIESP		
20	buzzard	BX	SPECIESP		
21	rough-legged buzzard	BoP	SPECIESP		
22	kestrel	BoP	SPECIESP		
23	corn crake	B	SPECIESP	1	
24	crane	B	SPECIESP	1	
25	golden plover	BoP	SPECIESP	1	EXP
26	pewit	BoP	SPECIESP		
27	Eurasian curlew	BoP	SPECIESP		VU
28	black-headed gull	BoP	SPECIESP		
29	common gull	BoP	SPECIESP		
30	herring gull	BoP	PARTIALP		
31	stock dove	BoP	SPECIESP		
32	ringdove	B	HUNTINGP		
33	Eurasian Collared Dove	BX	SPECIESP		
34	cuckoo	B	SPECIESP		
35	swift	BoP	SPECIESP		
36	black woodpecker	BX	SPECIESP	1	
37	great spotted woodpecker	B	SPECIESP		
38	woodlark	B	SPECIESP	1	
39	lark	B	SPECIESP		
40	barn swallow	BX	SPECIESP		
41	house martin	BX	SPECIESP		
42	meadow pipit	BoP	SPECIESP		
43.	yellow wagtail	B	SPECIESP		
44	white wagtail	B	SPECIESP		
45	redbreast		SPECIESP		
46	black redstart	BX	SPECIESP		
47	whinchat	B	SPECIESP		
48	blackbird	B	SPECIESP		
40	fieldfare	B	SPECIESP		

50	song thrush	B	SPECIESP		
51	redwing		SPECIESP		
52	marsh warbler	B	SPECIESP		
53	icterine warbler	B	SPECIESP		
54	lesser whitethroat	B	SPECIESP		
55	common whitethroat	B	SPECIESP		
56	barred warbler	B	SPECIESP		
57	blackcap	B	SPECIESP		
58	willow warbler	B	SPECIESP		
59	goldcrest		SPECIESP		
60	willow tit		SPECIESP		
61	great titmouse	B	SPECIESP		
62	blue tit	B	SPECIESP		
53	nuthatch		SPECIESP		
64	short-toed treecreeper	B	SPECIESP		
65	red-backed shrike	B	SPECIESP	1	
66	great grey shrike	B	SPECIESP		
67	jay	BX	SPECIESP		
58	magpie	B	PARTIALP		
69	daw	BX	SPECIESP		
70	rook	BoP	PARTIALP		
71	hooded crow	BX	PARTIALP		
72	raven	B	PARTIALP		
73	starling	B	SPECIESP		
74	tree sparrow	B	SPECIESP		
76	finch	B	SPECIESP		
76	brambling	BoP	SPECIESP		
77	greenfinch	B	SPECIESP		
78	goldfinch	B	SPECIESP		
76	siskin	BoP	SPECIESP		
80	linnet	B	SPECIESP		
81	common redpoll	BoP	SPECIESP		LC
82	bullfinch	BoP	SPECIESP		
83	hawfinch	B	SPECIESP		
84	bunting	B	SPECIESP		
85	meadowlark	B	SPECIESP		

Source: Report from avifauna monitoring for the "Bięcino" Wind Farm (Antczak 2010) - Appendix 6.

Breeding period

In total, there were 38 bird species identified at the area of the planned investment and in its direct vicinity (8 non-passerine species - nonpasseriformes, 30 passerine species - passeriformes) considered breeding birds, and in a greater distance (forest complexes, housing estates) additional 15 breeding or probably breeding species coming to the wind farm area were recorded (...).

The greatest number of species (27) were associated with tree stands and bush stands, belt green (alleys, tree lanes) and coastal zone. Meadows and wastelands (in practice, the presence of these habitats was limited to small plots near the Bięcino development and small area in sector 4 near the bosk located near wetlands) were the habitats of 5 species (corn crane, lark, yellow wagtail, whinchat and marsh warbler). Also 5 species were present on agricultural lands (quail, partridge, lark, yellow wagtail and meadowlark), whereas two species were recorded on water habitats and wetlands (mallard and crane) and with housing estates white wagtail) (...).

Total density of breeding complex was low and amounted to 78.9 pairs /100 ha (Table 3). A dominating species (more than 5% of breeding assemblage) was lark (34.0% of the assemblage) nesting in a density of 27 pairs /100 ha (8.1 pair/1 km of transect) in all identified habitats - primarily arable lands and parts of meadows. This species, due

to extremely high share in breeding assemblage can be considered a super-dominant. In addition, the other dominating species included meadowlark nesting in similar habitats as lark, however with a share of inclined elements (single bushes, trees, power lines) as well as bunting and whitethroat associated with coastal zone and belt green.

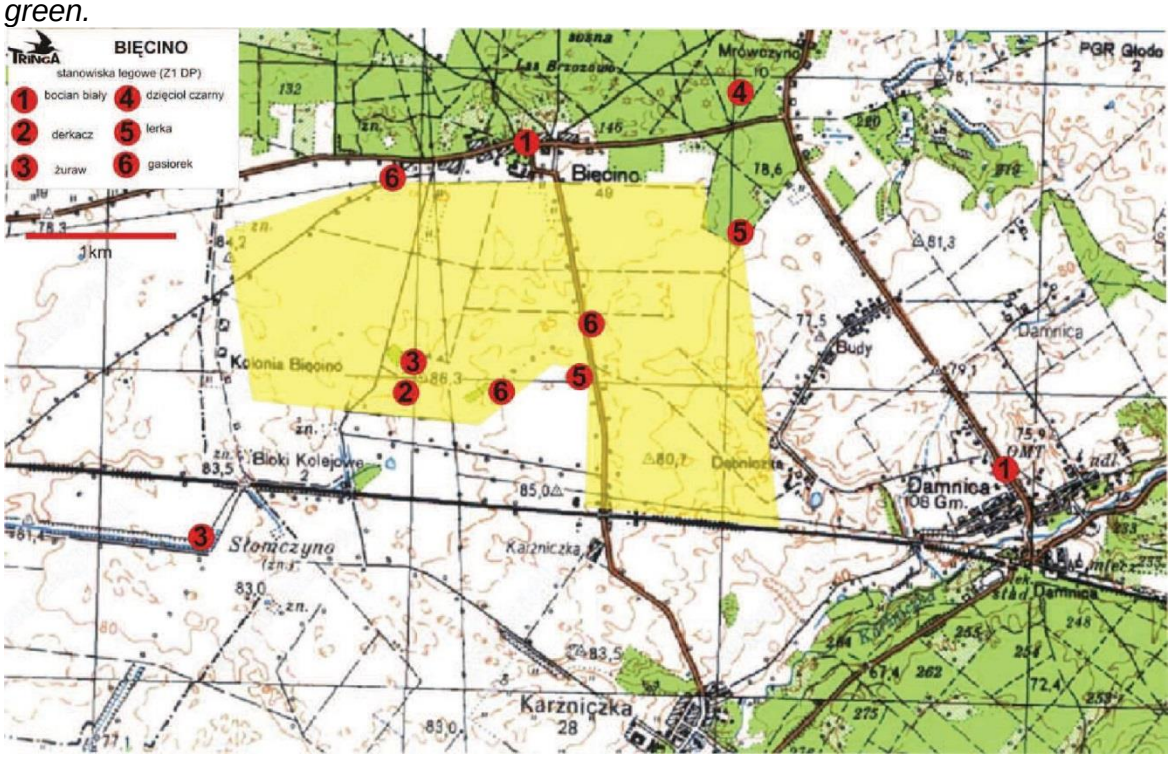


Fig. 9 Breeding sites of the selected bird species (Antczak, 2010)

BĘCINO	BĘCINO
stanowiska lęgowe (Z1 DP)	breeding sites (A1 BD)
bocian biały	white stork
dzięcioł czarny	black woodpecker
derkacz	corn crake
lerka	woodlark
żuraw	crane
gasiorek	red-backed shrike

Share of these species in assemblage was 5.3-8.5 % and density 4.2 -6.8 pair/100 ha (1.3 - 2.0 pair/1 km of transect. Sub-dominating species (2-5% of the assemblage) included 7 species associated with open habitats (quail and whinchat) or coastal zone, alleys, lanes, tree stands or bush stands (blackbird, blackcap, finch, fieldware and linnet). Densities reached by these species fell within the range of 1.7 - 3.0 pairs/100 ha (0.5 - 0.9 pairs/1 km of transect) and the share in assemblage - 2.1 - 3.7 %. The remaining species were identified in the number of 1-3 pairs (density: 0.4- 1.3 pairs/100 ha or 0.1 - 0.4 pairs/ km of transect; share in assemblage: 0.5 - 1.6%). A fauna curiosity was a case of raven nesting on a power line pillar in sector 4 at transect 9.

All species belonged to common and non-endangered groups. The species nesting in the investment area and included in Annex I to the Birds Directive included crane (1 pair on periodically wet and highly bushed bog area in sector 4), corn crake (1 pair on unused part of meadow near the wetland in sector 4), woodlark (two pairs - near the forest complex adjoining the north-eastern border and near the alley in the area of transect no. 2) and red-backed shrike (3 pairs - near the Bięcino development, at the alley along transect no. 2 and in the bush lane at the end of transect no. 5). Apart from the species nesting in the area, this area has been also used as functional one -

primarily as the feeding site - by the group of species associated with human estates (white stork, Eurasian Collared Dove, swift, swallows, black redstart and daw), water reservoirs (marsh harrier) or forest complexes situated in lower or greater distance (buzzard, sparrowhawk, stock dove, black woodpecker, raven, hooded crow and jay).
The area of the planned investment constituted a part of feeding ground of buzzard (2 pairs) nesting in the forest located towards north from Bięcino and in some wood stands at the south from the investment area, marsh harrier (1 pair) hunting regularly on the arable lands and sparrowhawk (1 pair) also associated with the wood situated towards north from Bięcino. White stork abundance was low - single occupied nests were recorded only in Bięcino and Damnica (fig. 3). In direct vicinity of the planned investment a nest of 1 pair of cranes was identified - in the small field reservoir located towards south from the railway line.
The remaining species nesting outside the investment area and penetrating it on regular basis included raven (1 pair), hooded crow (1 pair) and jays. The presence of swallows in the investment area has been regularly recorded - barn swallows and house martins as well as swifts nesting in the real estates. The obtained results demonstrate low attractiveness of the investment area for birds resulting from its typically agricultural nature with dominating arable lands. More numerous bird assemblage was associated only with tree stands, coastal zone and belt green (lanes, alleys), which should remain intact in effect of the planned investment. Practically all bird species were included into common and non-endangered groups, nesting in the tree stands similar to the ones recorded in the other, analogous areas in the agricultural landscape of the central part of Pomerania (see Górski 1988) and of the other regions of Poland (Tryjanowski et al. 2009). Also the species listed in Annex I to the Birds Directive nesting in the investment area (crane, corn crake, woodlark and red-backed shrike) or in its vicinity (white stork, black woodpecker, marsh harrier) belong to common and non-endangered species in the Pomerania.

Post-breeding dispersal and autumn migration

(...) Directional movements were demonstrated in 29 species (14 non-passerine and 25 passerine species). During the individual counts, the flight dynamics was highly diversified - abundance ranged between 0.4 and 106.0 individuals/observation hour and average volume of migration throughout the entire analysed period was only 20.6 individuals/observation hour. During several controls (in June, July, August and November) no flying by birds were recorded.
Mute swans flying by directionally were observed only on 7 November (18 individuals) and whooper swans on 31 October (23 individuals). Geese - white-fronted goose, greylag goose and non-identified birds of the Ansel genus as well as Canada geese - were observed during 4 controls - the most numerous flight of geese was recorded in the second half of October to early November. 265 birds were observed in total (in average 12.7 individuals/observation hour). Cormorants were observed only during a single control - on 15 September (11 individuals) and single grey herons on 9 September and 2 October.
Cranes clearly migrating towards south-west were identified only on 13 October (106 individuals in three flocks: 8, 34 and 64 at the highest level; daily average: 21.2/ hour). The remaining observations of cranes applied to local flights. Among Charadriiformes, the directional flights were recorded only in pewits, golden plovers and single Eurasian curlews. The first pewits were recorded on 18 July (36 individuals), whereas subsequent groups during three controls from half October to early November (118 individuals in total). Average migration volume in pewits was only 7.4 individual/hour in the days of species observations. Transit flight of golden plovers was observed during 3 controls - in September, October and November (total of 104 individuals/ 6.6 individuals/hour). Eurasian curlews (2 individuals) were stated only on 17 September.

In the dispersion period - on 4 July, also a flight of black-headed gulls - 110 individuals in five flocks (29, 19, 26, 20 and 16). The last non-passerine species that demonstrated transit flight was ringdove recorded during two controls - in October and November, however in low abundance (total of 29 individuals).
Among the passerine birds, more numerous flights were recorded only in starlings (highly extended flight - the first transit flights were recorded already in June and July, followed by September, October and early November). In the species migration days, 400 individuals during 6 controls were recorded in total (average of 12.3 individuals/hour). In addition, the flight was observed in larks (total of 261 individuals during 3 counts from the last decade of September to mid-October, 16.3 individuals/hour in average) and rooks (total of 190 individuals in 4 flocks during 2 controls at the turn of October and November, average of 18.1 individuals/hour). Directional flight of the remaining birds from this group was practically unnoticeable.
To summarise it can be stated that intensification of bird flights through the studied area was low, with two separate flight periods - in June and July the flight was associated with dispersion movements of starlings, pewits and black-headed gulls, whereas vast majority of species and higher abundances were demonstrated in mid-October to the end of first decade of November (...).

Use of the area by migrating birds as feeding and resting sites

Few flocks of pewits composed of 10 - 150 individuals have fed or rested within the arable lands primarily in sector 4 in September and mid-October. Observations of cranes in the second half of the year concerned the birds nesting in or around the area, the non-breeding flocks were observed on the fields only on 9 and 14 June and on 9 September (15, 6 and 6 individuals, respectively). Post-breeding groups of ringdoves appeared on early July and from that time to mid-October between several to 80 individuals have stayed there. At the end of July, the group of 6 swifts hunted over the fields. Identification of vast majority of the remaining non-passerine species (partridges, quails, mallards and cuckoos) referred to birds nesting in the area or in its direct vicinity.
Passerine birds did not for numerous feeding or resting flocks during migration. Flocks of staying larks were the most numerous in October (up to 214 individuals). Also the meadowlark were more numerous after breeding (maximum 104 individuals in August) and assembled on the fields or power lines. Groups of starlings have been observed already at the stage of dispersion movements (since the end of May), however their abundance did not exceed several dozen individuals. Similar abundance ranges were demonstrated for fieldfares, provided that this species was observed In the autumn period the groups of fieldfares were observed although their abundance has never exceeded several dozen individuals. The remaining species were far less numerous and formed no dense flocks (...).

Spring migration

Dynamics

In March and April 1480 individuals belonging to 19 species (14 non-passerine and 5 passerine species) demonstrating clear directional movements related to spring migration were identified. Abundance of migrants during the individual controls ranged between 6 and 723 individuals Only during the first March control no transit flights were recorded. The migration flights had low volume (similarly as autumn migrations) however dense - throughout the entire analysed period, the average number of flying birds was 49.3 individuals/hour, whereas during the two March controls this rate increased to 94- 150 individuals/observation hour - fig. 6. In these days, more than 82% of all spring migrants flew through the area.
The most numerous migrants were geese (white-fronted goose, greylag goose and non-identified birds of the Ansel sp. genus) - in total, during three counts, 990

individuals were recorded (66 individuals/observation hour in the days of flight of this group of birds in average). In addition, on 20 and 30 March, a relatively intensive flight of whooper swans was recorded - during 10 hours, 176 individuals flew over the planned wind farm in six v-formations (average of 17.6 individuals/hour). In sporadic cases, the whistling swans migrated with whooper swans (total of 17 individuals).
Pewits migrating directionally (84 individual) were recorded only on 20 March 2010. The remaining non-passerine birds were identified sporadically and in numbers not exceeding several individuals. Flight of passerine birds was hardly noticeable - the most numerous birds were starlings - the total of 118 individuals during two counts in March and the last April count. The flight of the remaining 4 species (meadow pipit, daw, hooded crow and fitch) can be considered marginal (...).

Use of the area by migrating birds as feeding and resting sites

(...)In the case of the areas of the planned investment, no presence of large feeding or resting flocks of any species was stated. The largest and only flock of pewits was recorded at the end of March (180 individuals feeding primarily in the third sector although flying over the entire area). In this day, the pewits were accompanied by a group of 12 golden plovers. The remaining non-passerine species were identified sporadically and in abundances not exceeding several individuals. Even the crane abundance from arrival in the second half of March was limited only to the individuals preparing for breeding in the neighbourhood.
Among the passerine-birds, the larger flocks were recorded only for starlings (up to 293 individuals in the second half of March) and fieldfares (98 individuals - early April). Finches were less numerous (up to 80 individuals in the mid-April), redwings (up to 50 individuals in early April) and siskins (20 individuals in late April). Abundance of the remaining species was limited to few - several individuals being the breeding fraction associated with the area.

Wintering

In December - February period, 7 - 10 bird species were recorded during the individual controls. Buzzard and rough-legged buzzard were observed from the falconiformes birds. The remaining species included small groups of fieldfares, tree sparrows, siskins, bullfinches and bunting (several to 20 individuals). The remaining species were present in even lesser numbers. Such low abundances in this period were certainly influenced by uniquely snowy and frosty winter - practically from the second half of December to mid-March, the whole area was covered with dense, locally reaching even a meter deep snow and almost all birds assembled near Bięcino locality or along the main alley near the road between Bięcino and Karżniczka.

Falconiformes birds

(...) The most numerous species was definitely buzzard recorded throughout the entire year (attendance: 93%). Near the farm area 2 pairs of buzzards were nesting. These birds have been observed repeatedly during the individual counts from which it can be concluded that they have penetrated the most intensively the entire area while hunting rodents or flying over the feeding ground - resting site/nest route. The second commonly occurring bird was marsh harrier. At the wind farm area, it was observed in the first season since commencement of the studies to the end of August, whereas in the second year it was observed only once - during the last May control (general attendance - 30%). It should be assumed that at least in the first year of studies the pair nested in one of the wetlands located in a distance exceeding 2 km from the area borders (all potential breeding sites in a radius up to 2 km were penetrated in 2009 and 2010 without any positive results). The birds from this pair have also penetrated and hunted rodents throughout the area. The number of observations was however four times lower comparing to buzzards. The last regularly observed species was the sparrowhawk nesting in the wood adjoining Bięcino from the north and irregularly

(observed during 6 counts) visiting the farm area, where it was hunting small passerine birds. All the remaining species - red kite, Montagu's harrier, hawk, rough-legged buzzard and kestrel were recorded only during individual controls, with regard to which these records should be considered as observations of birds of passage or sporadically flying-by.

Complete text of ornithological monitoring by Antczak (2010) is provided in Appendix 6 constituting the integral part of this "Report".

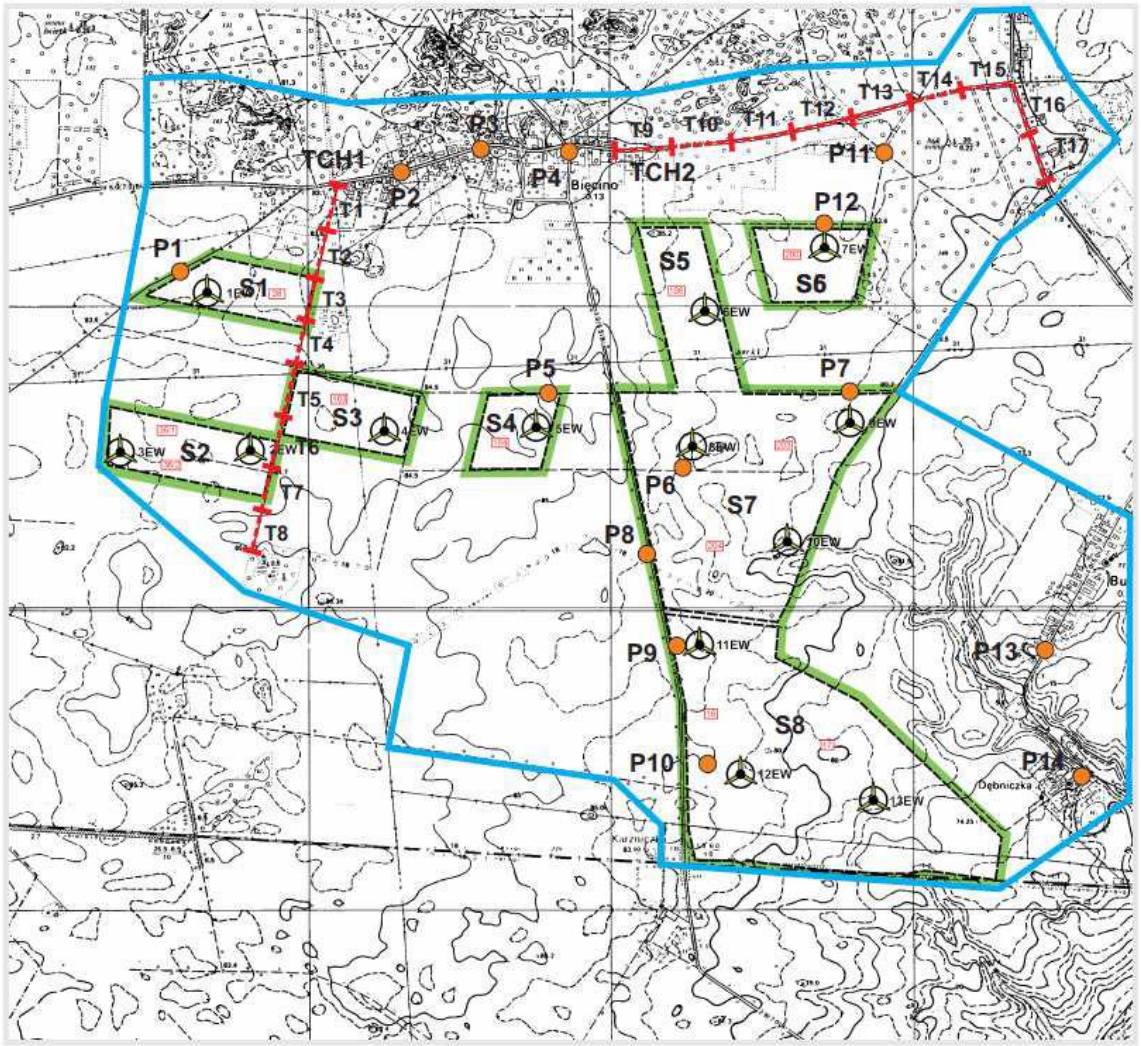
3.2.5.4 Chiropterological monitoring

The report from the chiropterological monitoring performed in the period from June 2009 to the end of May 2010 is contained in the "Report and assessment of the potential impact of the planned location of the "Bięcino" wind farm on bats" (Kościów 2010).

According to the aforementioned study (Kościów 2010):

Field works covered finally 29 controls, during which the night monitoring (listening) using the ultrasonic detector were performed. Each night control lasted 5-6 hours. Detector monitoring along with assessment of observation incidence of the observed bats were performed in the period between 1 VI 2009 and 31 V 2010. One should emphasise here that the dates of performance of the individual controls were adjusted to the weather conditions to skip the periods of low activity of bats caused by rain precipitations, sudden several days long cooling down or strong wind. In order to verify the results of bat activity, 4 additional controls were performed (...).

For the purposes of monitoring, 2 transects were delineated: TCH1 and TCH2 [Fig. 11], which were divided into 200-metre long sections constituting the control units. In this way, the total of 17 transect sections were delineated, which were marked as T1 - T8 for transect TCH1 and T9 - T17 for transect TCH2. One should note that the original marking of transects was abbreviated (which were previously used in the other studies, for example in the Bięcino WF screening) in order to simplify the records and therefore to ensure greater legibility both on field (working) maps, in database and figures to the report. Total number of both transects was 3.2 km (...).



Oznaczenia:

- Punkty Nasłuchu Detektorowego (**PND**): P1 - P14. Numeracje na razie usunięto w celu zachowania przejrzystości wyników rozmieszczenia nietoperzy (podobnie w przypadku transektów).
- Transekty CHiropterologiczne (**TCH**): **TCH1** składa się z odcinków **T1-T8**; natomiast **TCH2** składa się z odcinków **T9-T17**.
- obszar badań wraz z obszarami położonymi poza obszarem inwestycji (**POI**)
- obszar projektowanej lokalizacji farmy wiatrowej= obszar inwestycji (**FW**), wraz z numerami sektorów (**S1-S8**)

Fig. 10 Monitoring points and transects of the chiropterological monitoring (Kościów 2010)

Oznaczenia:	Legend:
Punkty Nasłuchu Detektorowego (**PND**): P1 - P14. Numeracje na razie usunięto w celu zachowania przejrzystości wyników rozmieszczenia nietoperzy (podobnie w przypadku transektów).	Detector Monitoring Points (**PND**): P1 - P14. Numbering was temporary removed in order to ensure transparency of the results of bat distribution (as in the case of transects).
Transekty CHiropterologiczne (**TCH**): **TCH1** składa się z odcinków **T1-T8**; natomiast **TCH2** składa się z odcinków **T9-T17**.	Chiropterological transects (**TCH**): **TCH1** consists in the sections **T1-T8**; whereas **TCH2** consists in the sections **T9-T17**.
obszar badań wraz z obszarami	study area along with the areas located

położonymi poza obszarem inwestycji (**POI**)	outside the investment (**POI**)
obszar projektowanej lokalizacji farmy wiatrowej= obszar inwestycji (**FW**), wraz z numerami sektorów (**S1-S8**)	area of the planned location of wind farm = investment area (**FW**), along with sector numbers (**S1-S8**)

Apart from transects, also 14 permanent Detector Monitoring Points were set forth. Similarly as in the case of transects, the markings were abbreviated and assigned with the numbers between P1 and P14 to each control point. DMPs were distributed evenly within the investment area and outside the borders of wind farms. Distribution of control points (DMPs) and course of transects (CHT) was delineated and set forth in a way to ensure their representativeness for habitats present within the studied area (investment area + areas located in direct vicinity of the wind farm borders) and to consider the range of detector and enable control of the environment near each wind turbine (...).

Detector monitoring (listening) was commenced just before sundown. For each control point 10-15 minutes were allocated, whereas for walking of 2-2.5 km of the transect - approx. 40 minutes. Total maximum duration of all tasks performed during each night control amounted to 5-6 hours of field works (Table 2). Throughout the day, the bats were monitored in the period from late evening hours to sunrise, where - due to active flight ability - the bats fly from their daily shelters to the feeding grounds (feeding) and to watering places. Detector monitoring was commenced before sundown or in the middle of the night, depending on weather conditions, and continued to the sunrise or early morning - where visual counting of feeding bats was possible (depending on species).

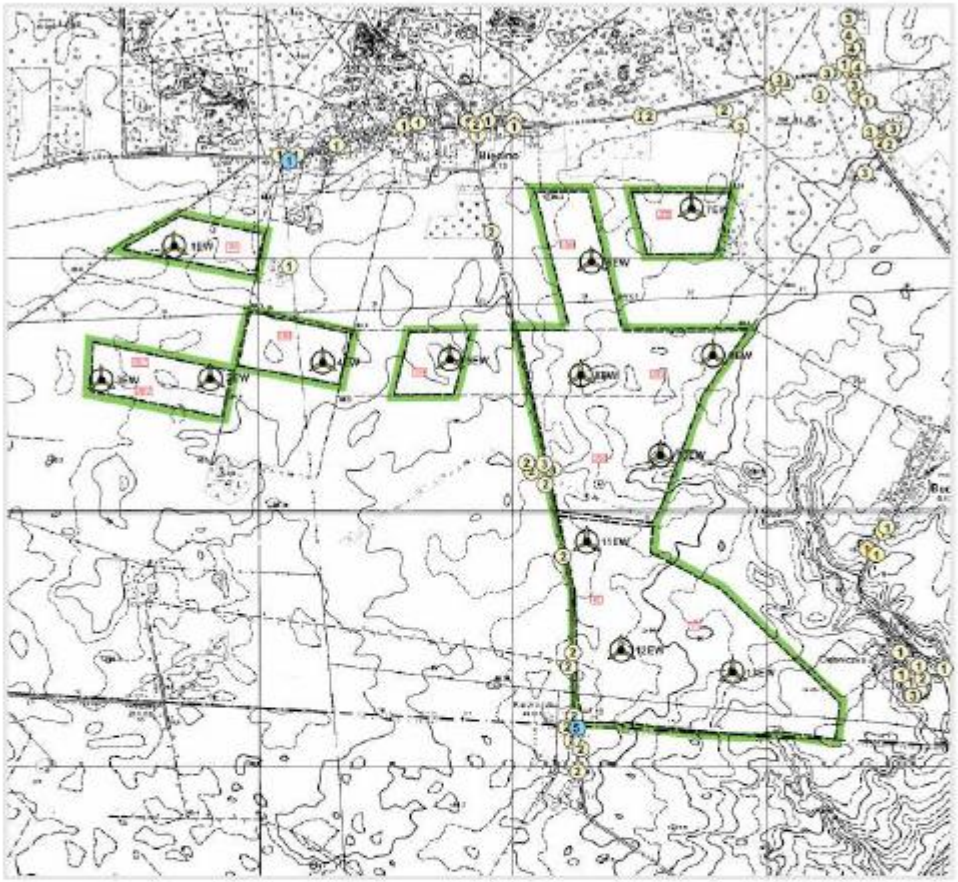
RESULTS

In effect of field works, the presence of 5 bat species was determined:

- *Natterer's bat Myotis nattereri (Kuhl, 1817).*
- *common pipistrelle P. pipistrellus (Schreber, 1774),*
- *Nathusius' pipistrelle Pipistrellus nathusii (Keyserling et Blasius, 1839),*
- *common noctule Nyctalus noctula (Schreber, 1774),*
- *brown long-eared bat Plecotus auritus (Linnaeus, 1758).*

Provided that it should be noted that the Natterer's bat was observed outside the investment area only in winter, whereas from among the other species, only the single individuals of Nathusius pipistrelle and common noctule were observed irregularly within the investment area, although these two species were not observed in direct vicinity of the planned locations of wind power plants. These bats were observed primarily outside the wind power plant impact zone that is in a distance exceeding 200 metres. This was found on the basis of the number of observations and frequency of observations of bats in the individual monitoring points and transect sections and on the regularly controlled selected objects (located outside the borders of the investment area or at the border of wind farm and areas located nearby).

In the area of planned location of the wind farm, 3 bat species were observed on regular basis: both pipistrelle species (P. pipistrellus and Pipistrellus nathusi) and common noctule Nyctalus noctula. Brown long-eared bat Plecotus auritus was detected as late as in spring 2010 - this species is difficult to detect using the detector, since its sonar and emitted ultrasounds have very short range. In addition, ultrasound emission is discontinued during hunting - after detecting a victim, the brown long-eared bats attack their victims using only the hearing sense (a long-eared bat hears how the insects feed and move on the surface and of course move their wings) and vision. Despite the fact that chiropterofauna of the studies area enriched in spring with another new species, total number of the identified species and related biodiversity of bat assembly remained poor comparing to the other Pomeranian regions.



Oznaczenia:

① ① - **karlik malutki** *Pipistrellus pipistrellus* (Schreber, 1774) - stanowiska osobników hibernujących oznaczono niebieskimi punktami

② - **karlik większy** *Pipistrellus nathusi* (Keyserling et Blasius, 1839)

③ - **borowiec wielki** *Nyctalus noctula* (Schreber, 1774)

④ - **gacek brunatny** *Plecotus auritus* (Linnaeus, 1758)

⑤ - **nocek Natterera *Myotis nattereri*** (Kuhl, 1817) - stanowiska osobników hibernujących oznaczono niebieskimi punktami

Fig. 11 Species composition and distribution of bats identified within the planned "Bięcino" wind farm (Kościów, 2010)

Oznaczenia:	Legend:
karlik malutki *Pipistrellus pipistrellus* (Schreber, 1774) - stanowiska osobników hibernujących oznaczono niebieskimi punktami	**common pipistrelle** *Pipistrellus pipistrellus* (Schreber, 1774) - habitats of the hibernating individuals were marked with blue dots
karlik większy *Pipistrellus nathusi* (Keyserling et Blasius, 1839)	**Nathusius' pipistrelle** *Pipistrellus nathusi* (Keyserling et Blasius, 1839)
borowiec wielki *Nyctalus noctula* (Schreber, 1774)	**common noctule** *Nyctalus noctula* (Schreber, 1774)
gacek brunatny *Plecotus auritus* (Linnaeus, 1758)	**brown long-eared bat** *Plecotus auritus* (Linnaeus, 1758)
nocek Nattcrera *Myotis nattereri* (Kuhl, 1817) - stanowiska osobników	**Natterer's bat *Myotis nattereri*** (Kuhl, 1817) - habitats of the hibernating

hibernujących oznaczono niebieskimi punktami	individuals were marked with blue dots

Comparing to the number of bat species occurring in our country - 25 bat species (PUCEK, RACZYŃSKI [edit.] 1983; MITCHEL-JONES et al. 1999) - the number of bat species identified in the area of the planned location of the wind farm (3-5 species) is not really impressive. In addition, it should be pointed out that vast majority of species identified in the area of the planned location of the wind farm was observed on regular basis primarily outside the investment area. The obtained number of bat species constitutes only 12-20% of the species composition of domestic chiropterofauna - it is not much, since in the central part of the Pomerania, in the spring and summer season, between 8-11 (9 species in the "Dolina Słupi" (Słupia Valley) landscape park, Darżlubska Forest - 10 species or even up to 17 species of bats as for exampled in the Gdansk Pomeranian Region (CIECHANOWSKI et al. 2006; CIECHANOWSKI 2003) were observed.

From among 5 bat species observed in the studied area, the regularly observed ones (described by the incidence continuity index "C%") included: common pipistrellei P. Pipistrellus, followed by common noctule Nyctalus noctula (Table 5, below). Nathusius' pipistrelle was less commonly observed and the brown long-eared bat Plecotus auritus was identified as late as in spring. This analysis considered no wintering bats due to negligent/accidental importance of the wintering population for the studied area, which was demonstrated previously - thus the table below contains no Natterer's bat Myotis nattereri. One should remember that 84% of bats observations (87.5% of individuals) concerns the areas located outside the wind farm borders, which is presented on the graphic data analysis.

***To summarise**, the bats were rarely observed in the areas of open arable fields, at which the wind turbines are planned. All bat observations within the borders of the investment area applied only to the regions of field alleys between Bięcino and Karżniczka in the area of detector monitoring point P8 and outside the wind farm, at the border of the investment area as well as along the same alley near the railway line.*

The bats were more frequently and numerously observed in the Bięcino locality, at the edge of woods near Mrówczyn and within the development area of the Budy village and for the most in Dębniczka and Karżniczka. All locations of bats presence presented in this study are situated outside the area of the investment. The number of bats observed within the area in which installation of wind turbines is permitted was - on the basis of the aforementioned results - definitively lower than the number of bats observed outside the area of the wind farm.

Distribution

Analysis of spatial distribution of bats within the studied area demonstrated that bats were hardly observed near the planned locations of wind turbines - one should point out however that Nathusius' pipistrelles flying over the open fields (1 metre over the surface near the cereal fields) were observed twice, at the southern edges of the Bięcino locality in a distance of approx. 600 metres towards west from sector s5 of the wind farm - however the number of these observations accounted for 1.1% of all detected bat activity (breakdown of observations of individual species is presented on page 17 in Table 4). Observations described in this study applied to the single individuals which hunted on fields near the field road and alley connecting Bięcino and Karżniczka village.

Analysis of spatial distribution of bats in the spring and summer season demonstrates that within the studied area the bats were primarily observed:

- in the area of Dębniczka and Bięcino developments:

- in the Bięciński Forest along the road, in particular near Mrówczyn;

- and along the old field alley planted with lime trees situated between Bięcino and Karżniczka.
Analysis of dominating observations of bats at the individual transect sections (CHTs) and in the control points (DMPs) demonstrates that the greatest number of bat observations was recorded in the area of point P14 that is in the area of pond in Dębniczka locality. It was followed by the area of points P4 (Bięcino) and P8 (lime tree alley). In terms of transects, the bats - primarily common noctules - were observed most frequently at the sections T15-T17 that is in the region of road crossing near Mrówczyn (...)

Use of the investment area by the bats

Within the studied area in the region of the planned wind farm, the presence of 3 feeding grounds (Ż1, Ż2 i Ż3), watering place of the bats (W1) and one daily shelter of the bats (K1), were observed in effect of annual monitoring. On the basis of frequency of bat observations during detection, the distribution of permanent areas of relatively regular presence of bats were determined [see Fig. X].

Complete text of chiropterological monitoring (Kościow 2010) is provided in Appendix 7 constituting the integral part of this "Report".

3.2.6. Environmental processes and interrelationships of the location of the investments with surrounding areas

Geodynamic, hydrological and environmental processes are of essential importance for the area of the location of the "Bięcino" wind farm.
The geodynamic processes within the small parts of upland slopes of steep inclination (slopes of the watercourse valleys and local basins and terrain inclines) and on the anthropogenic embankments include potential presence of minor surface mass movements. Numerous signs of morphodynamic activity are observed in the river valleys. At the bottoms of the river valleys, side and subsurface erosions and local accumulation of rock material are observed. Vegetation in the watercourse valleys has a stabilising effect on dynamics of natural environment, in particular in the scope of morphodynamics (stabilisation of slopes and beds) and hydrographic conditions (reduced surface outflow thanks to retention capacity of vegetation). Due to mild topography, these processes in the area of the location of the investment are of low strength.
From among environmental processes, the specific processes for this area include succession of herbaceous vegetation, locally shrub and tree vegetation on the post-agricultural areas within the moraine upland, succession of water and waterside vegetation in the vicinity of small water basins - at the areas of agricultural use the environmental process are limited by current agrotechnical activity.
Environmental relations in the area of the location of the "Bięcino" wind farm will be performed primarily by means of:

- water circulation - surface flow of waters takes place primarily towards the watercourse valleys and their tributaries - towards south;
- atmospheric circulation - due to dominating winds from the western sector, the inflowing air masses come from the agricultural areas and agricultural and forest areas;
- flora and fauna migrations (environmental relations) stimulated by the ecological system[4] - at the moraine upland the system is poorly formed - its structure consists in a mosaic of small ecological patches (forest and semi-forest), whereas

[4] The system of environmentally active areas, ecological patches and corridors entering into a given area and enabling environmental functional relations in horizontal plane. The presence of environmental system determines maintenance of relative ecological sustainability of natural environment, enriches its material and functional structure and diversifies the landscape in terms of physiognomy.

environmental between the local ecological patches at the upland are favoured by agricultural use of land.

Ecological corridors

Pursuant to the Act on nature conservation (uniform text in Journal of Laws of 2009, No. 151, item 1220 as amended - Article 5(2)) ***the ecological corridor is the area enabling migration of plants, animals or fungi.***

In addition, Article 23.1 of this Act states that *the area of protected landscape includes the areas protected due to differentiating landscape of diversified ecosystems, valuable in terms of opportunity of satisfying the tourist and entertainment needs or* ***function of ecological corridors.***

National level

The area of the "Bięcino" wind farm is covered with the following national-scale planning studies, in which the ecological corridors were delineated (in the chronological order):

1) „Strategia wdrażania krajowej sieci ekologicznej ECONET-Polska" (Strategy for implementation of the national ecological network ECONET-Poland) (Liro - edit. 1998),

2) „Zwierzęta a drogi". Metody ograniczenia negatywnego wpływu dróg na populacje dzikich zwierząt" (Animals and roads. Methods of mitigating the negative impact of roads on wildlife populations) (Jędrzejewski et al. 2004),

3) „Ochrona łączności ekologicznej w Polsce" (Protection of ecological connectivity in Poland) (Jędrzejewski, Ławreszuk 2009),

4) National Spatial Development Concept 2030 (2012).

Ad. 1)

The "Strategy for implementation of the national ecological network ECONET-Poland" (Liro - edit. 1998) contains the concept of establishing the ecological network at the territory of Poland. This author's concept has not been formalised in a form of a legal document. The proposals contained in this concept area highly disputable and supported with no scientific evidences [M.P] .

According to this study, the area of the location of the "Bięcino" wind farm is situated outside the range of the established core areas and ecological corridors (Fig. 12 a)[5].

Ad. 2)

"Animals and roads. Methods of mitigating the negative impact of roads on wildlife populations" (Jędrzejowski et al. 2004) study concerns terrestrial migration of mammals (e.g. moose, wolves, lynxes ...). According to this study, the area of the investment is located outside the range of the migration corridors (Fig. 12 b).

Ad. 3)

The "Protection of ecological connectivity in Poland" (Jędrzejewski, Ławreszuk 2009) study contains the „Materiały konferencji międzynarodowej >Wdrażanie koncepcji korytarzy ekologicznych w Polsce< "Materials from the international conference >Implementation of the ecological corridor concept in Poland, (Białowieża, 22-22 XI 2008)".

The following papers are of the "national" importance;

- Jędzejewski W. „Sieć korytarzy ekologicznych łączących obszary chronione w Polsce" (System of ecological corridors connecting the protected areas in Poland) (in vast majority repetition of the study referred to in item 2) - According to this study, the area of the investment is situated outside the range of the ecological corridors, including so called core corridors (Fig. 13 c);
- Degórski M. „Korytarze ekologiczne w Koncepcji Przestrzennego Zagospodarowania Kraju" (Ecological corridors in the National Spatial Development

[5] The maps of Poland are drawn-up in review scales which prevents precise plotting of corridors on the topographic maps.

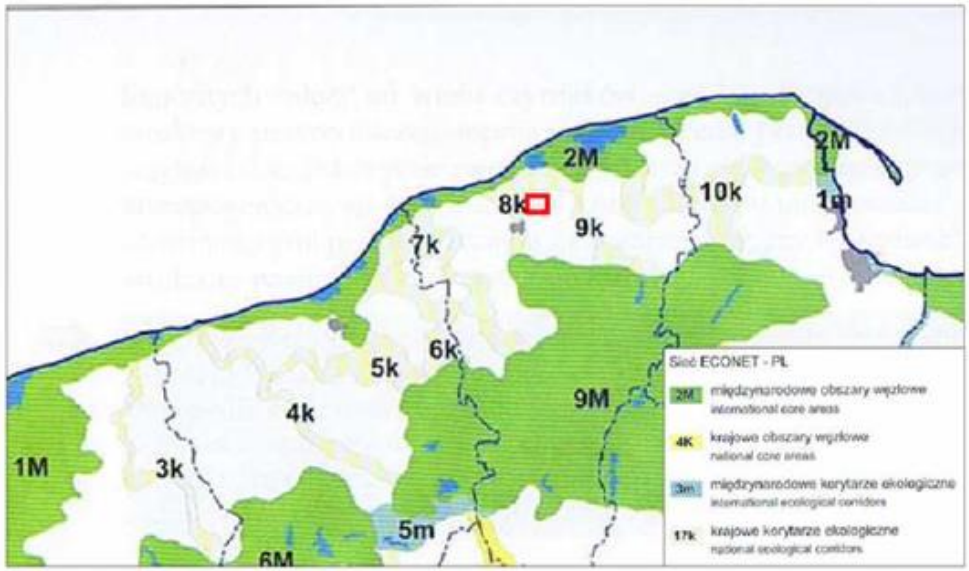
Concept) - a concept analogical to item 3).

Ad. 4)

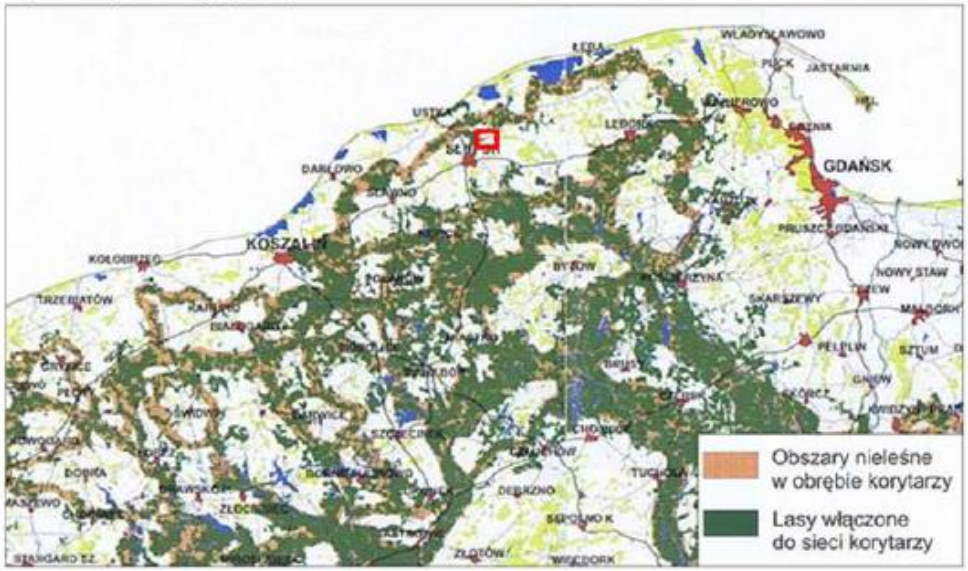
"National Spatial Development Concept 2030" (2012) contains a map (Figure 28) entitled "Kierunki polityki przestrzennej wobec obszarów funkcjonalnych cennych przyrodniczo" (Spatial policy directions with a view to environmentally valuable functional areas). Accoridng to this concept, the area of the location of wind power plants is situated outside the delineated ecological corridors (Fig. 12 d)[6].

[6] The maps of Poland are drawn-up in review scales which prevents precise plotting of corridors on the topographic maps.

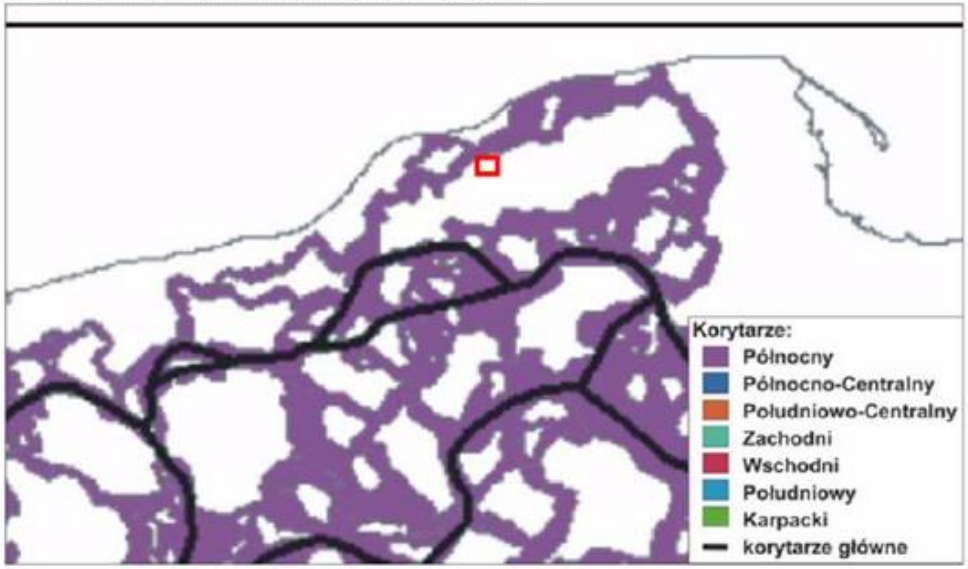
a) "Strategia wdrażania krajowej sieci ekologicznej ECONET-Polska" (1998)



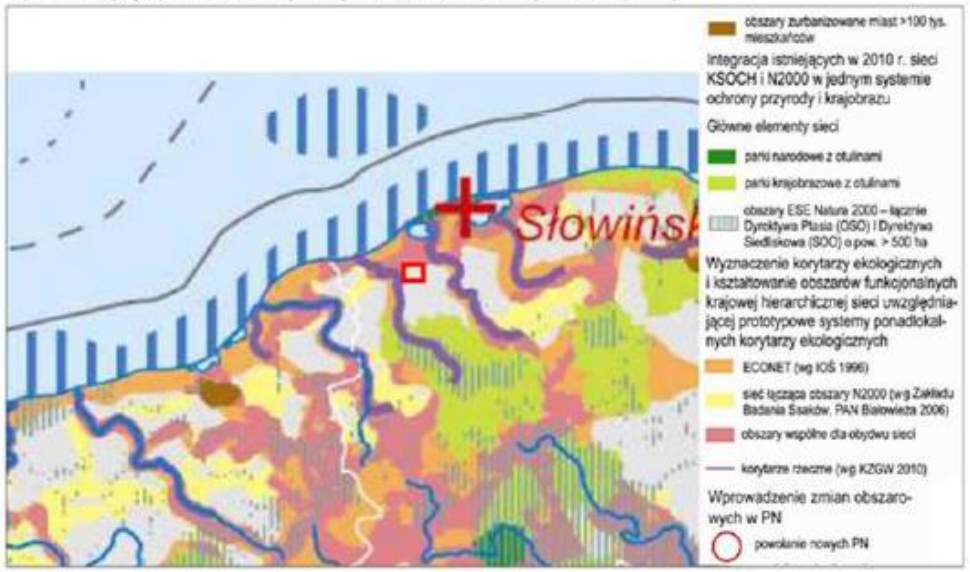
b) "Zwierzęta a Drogi" (2004)



c) "Ochrona łączności ekologicznej w Polsce" (2009)



d) "Koncepcja przestrzennego zagospodarowania kraju 2030" (2012)



zespół elektrowni wiatrowych "Bięcino"

Rys. 12 Lokalizacja przedsięwzięcia na tle sieci korytarzy ekologicznych na Pomorzu 1:150.000

a) "Strategia wdrażania krajowej sieci ekologicznej ECONET-Polska" (1998)	1) „Strategia wdrażania krajowej sieci ekologicznej ECONET-Polska” (Strategy for implementation of the national ecological network ECONET-Poland) (1998),
b) "Zwierzęta a Drogi" (2004)	b) "Zwierzęta a Drogi" (Animals and roads) (2004)
c) "Ochrona łączności ekologicznej w Polsce" (2009)	c) "Ochrona łączności ekologicznej w Polsce" (Protection of ecological connectivity in Poland) (2009)
d) "Koncepcja przestrzennego zagospodarowania kraju 2030" (2012)	d) "National Spatial Development Concept 2030" (2012)
Sieć ECONET – PL	ECONET – PL network
międzynarodowe obszary węzłowe	international core areas
krajowe obszary węzłowe	national core areas
międzynarodowe korytarze ekologiczne	international ecological corridors
krajowe korytarze ekologiczne	national ecological corridors
Obszary nieleśne w obrębie korytarzy	Non-forest areas within the corridors
Lasy włączone do sieci korytarzy	Forests included in the corridor system
Korytarze:	Corridors:
Północny	Northern
Północno-Centralny	North-Central
Południowo-Centralny	South-Central
Zachodni	Western
Wschodni	Eastern
Południowy	Southern
Karpacki	Carpathian
korytarze główne	core corridors
zespól elektrowni wiatrowych "Bięcino"	"Bięcino" wind farm
obszary zurbanizowane miast >100 tys. mieszkańców	urbanised areas of the cities >100 thousand of population
integracja istniejących w 2010 r. sieci KSOCH i N2000 w jednym systemie ochrony przyrody i krajobrazu	Integration of the KSOCH and N2000 networks existing in 2010 in a single nature and landscape protection system
Główne elelementy sieci	Key system components
parki narodowe z otulinami	national parks with buffer zones
parki krajobrazowe z otulanami	landscape parks with buffer zones
obszary ESE Natura 2000 - łącznie Dyrektywa Ptasia (OSO) i Dyrektywa Siedliskowa (SOO) o pow. >500 ha	Natura 2000 EEN areas - Birds Directive (SPA) and Habitats Directive (SAC) of the area >500 ha
Wyznaczenie korytarzy ekologicznych i kształtowanie obszarów funkcjonalnych krajowej hierarchiczneh sieci uwzględniającej prototypowe systemy ponadlokalnych korytarzy ekologicznych	Establishment of ecological corridors and forming the areas of the functional national hierarchic network considering the prototype systems of supra-local ecological corridors
ECONET (wg IOŚ 1996)	ECONET (according to EPI 1996)
sieć łącząca obszary N2000 (wg Zakładu Badania [illegible], PAN Białowieża 2006)	network connecting the N2000 areas (according to the Mammal Research Institute, Polish Academy of Sciences in Białowieża, 2006)
obszary wspólne dla obydwu sieci	areas common for both networks

korytarze rzeczne (wg KZGW 2010)	river corridors (according to the National Water Management Board, 2010)
Wprowadzenie zmian obszarowych w PN	Introduction of territorial changes in the NPs
powołanie nowych PN	establishment of the new NPs
Rys. 12 Lokalizacja przedsięwzięcia na tle sieci korytarzy ekologicznych na Pomorzu 1:150.000	Fig. 12 Location of the investment against the ecological corridor system in the Pomerania 1:150 000
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siedziba: ul. Przemysłowa 21/1, 52-333 Wrocław biuro: ul. św. Mikołaja 61-62/6, 50-127 Wrocław	Registered seat: 21/1 Przemysłowa Street, 52-333 Wroclaw, Office: 61-62/6 św. Mikołaja Street, 50-127 Wroclaw
tel/fax: 71 398-84-16, mail: biuro@ansee.pl	phone/fax: 71 398-84-16, email: biuro@ansee.pl

Regional and subregional level

The area of the location of wind power plants is situated outside the area of ecological system of the regional and subregional level. The nearest regional ecological corridor is the Łupawa River Valley constituting at the same time the Natura 2000 area of Community importance "Dolina Łupawy" PLH220036 (specification of the area provided in chapter 4) - this area is situated in a distance of 3 km from the planned "Bięcino" wind farm.

This corridor enables and stimulates animal migration (primarily fish, birds related to water environment and wetlands, certain mammals, etc.) and movement of plant diaspores. It is also a place of transport of abiotic matter (river water, bedload and transported sediments) whereas the valley forms modify local air circulation.

The nearest elements of ecological system of subregional level is the Charstnica River Valley (running in a distance of approx. 1.5 km from the nearest wind power plants (see cartographic appendix).

Local level

In the direct vicinity of the "Bięcino" wind farm, the parts of ecological system of local level in a form of forest complexes located in a distance of approx. 150 m towards north from the nearest wind power plants are located (see cartographic appendix).

No environmental structures forming the component of the ecological system are absent directly on the territory of the location of the "Bięcino wind farm.

3.3. Diagnosis of environmental anthropization status

The main signs of the environmental anthropization of the area of the investment location and its direct surroundings include:

- domination of agricultural land use, resulting in, among others, synanthropization of vegetation, degradation of ecological structure of the area and specifics of landscape displaying the features of cultural agricultural landscape;
- rural settlements: dense development of the Bięcino locality, Dębnicka locality and individual settlements of the Karżniczka locality - homestead development with backyard gardens, service and production and utility development - sources of pollution emission to atmosphere, of municipal and utility sewage and waste;
- agricultural production facilities in the Bięcino, Karżniczka and Budy localities located in a minimum distance of approx. 500 m and more - sources of heat and technological emission;
- hardened and ground road system (vehicle transport as the source of emission of pollution to air and of noise), including primarily local roads running in direct vicinity of the investment area;
- railway line on the Stargard Szczeciński-Gdansk route;
- low, medium and high voltage power line (400 kV).

Aerosanitary conditions

The potential sources of air pollution within the area of the investment include the following:

- Household heating appliances, sources of heat and technological emission from utility facilities;
- emission of transport pollution from roads of local and supralocal level (poviat roads) and railway transport;
- emission of pollution from tractors and agricultural machinery
- fugitive emissions of particulate matter from non-vegetated areas (e.g. ground roads).

Pursuant to the "Environmental protection programme for the Damnica Commune for 2008-2011 with 2012-2015 perspective", the aerosanitary conditions of the commune are mainly affected by the emitters located outside the commune. In addition, small

distance (approx. 10 km) from Słupsk and inflow of pollution from this direction play a significant role.
At the territory of the Damnica commune, a significant and onerous source of atmospheric air pollution in the heating season is medium and low emission from combustion of low-calorific coal in the households and small local boiler houses. This energy carrier adversely affecting the atmospheric air quality is used for heating of flats by vast majority of households in the commune.
Transport pollution of atmosphere can cause in adverse changes of production capacity of soils and affect negatively on near-road vegetation (trees, shrubs and herbaceous vegetation) as well as on health on the nearby inhabitants. This adverse effect is caused by emission of exhaust fumes containing among others heavy metals, sulphur dioxide and nitrogen oxides as well as particulate matter. Vehicle pollution of atmosphere include toxic compounds resulting in deteriorated photosynthesis, chlorophyll degradation, disturbances in aspiration and transpiration, discolouration, chlorosis and necrosis of leaves, ageing, growth disorders and reduced resistance to diseases and pests (Łukasiewicz, 1995).
At the area of the Damnica commune, no studies on atmospheric air pollution concentration were performed. In the "Report on the condition of the environment in the Pomeranian Voivodeship in 2010" published by the Voivodeship Environmental Protection Inspectorate in Gdansk" (VEPI, 2011), air quality in the Pomeranian region, to which the area of the investment belongs, was classified into A class, excluding the categories applying to PM10 concentration and benzo(a)pyrene concentration, in which air quality was classified to C class.
The main source of atmospheric air pollution within the commune includes pollution from the transport sector (vehicle transport) and agricultural sector (production plants located in the Bięcino, Karżniczka and Budy localities) and municipal sector that is low emission from local boiler houses - utility plants and from individual households. The share of particulate matter and gas emission from household heating appliances is difficult to determine. It may be estimated however that slow improvement in effect of a change of used fuels takes place. In addition, the atmospheric air pollution sources within the commune include technological processes in the production plants. Due to distance of the investment area from the concentrations of production plants (the nearest small plants are located in Damnica in a distance of approx. 2.5 km towards east), city agglomeration (the nearest - Słupsk - is situated in a distance of approx. 10 km) and larger vehicle transport infrastructure (national road no. 6 in a distance of approx. 4 km), it can be assumed that the aerosanitary condition is advantageous.

Noise

No industrial plants and onerous facilities in terms of noise emission to the environment are situated within the area of the investment.
The source of noise emission in this region is primarily vehicle transport, for the most on the local roads near the area of the investment and railway line of Damnica-Koszalin route.
The potential sources of acoustic nuisance in the surroundings of the area are utility and municipal facilities located in Bięcino. In addition, a source of acoustic nuisance within the area of the investment is noise emitted by agricultural machinery.
In the area of the investment location, the facilities and areas of functions protected due to acoustic nuisance include single agricultural settlements and rural development at the edges of localities (primarily homestead development).
The permissible noise level in the environment is regulated by the Ordinance of the Minister of Environment of 14 June 2007 (Journal of Laws No. 120 item 826) and the Ordinance of the Minister of Environment of 1 October 2012 amending the ordinance on the permissible noise levels in the environment (Journal of Laws of 08.10.2012,

item 1109);

Electromagnetic radiation

The air HV line 400 kV is installed in the area of the investment location, in a distance of approx. 200 m from the nearest wind power plants (see cartographic appendix). In addition, there are air medium and low voltage power lines installed within the investment area.

The other sources of electromagnetic radiation in the area of the investment are the base stations of mobile telephony. The nearest base station of mobile telephony is situated in the Budy locality in a distance of approx. 1.5 km towards east from the nearest planned wind power plant.

Water pollution and changes to water circulation system

Surface waters

The nearest watercourse, waters of which are subject to periodic purity testing is the Łupawa River, pursuant to the "Report on the condition of the environment in the Pomeranian Voivodeship in 2010 (study of the Voivodeship Inspectorate of Environmental Protection 2011), whereas the nearest measuring point was located in the Smołdzino locality in a distance of approx. 16 km towards north from the investment area. The Łupawa River waters were classified in this point into the II purity class with decisive parameters of BOD5, COD and Kjeldahl Nitrogen content.

Groundwaters

In the area of the investment location, groundwaters were subject to the quality testing. The nearest water intake, waters of which have been tested on regular basis by the VIEP (Voivodeship Inspectorate of Environmental Protection) in Gdansk is the Bobrowniki intake (approx. 5 km towards east from the investment area). Pursuant to the"Report on the condition of the environment in the Pomeranian Voivodeship in 2010) study (VIEP 2011), groundwaters from this intake were classified into the I purity class.

In addition, pursuant to the "Environmental Protection Programme of the Damnica Commune..." (2008): *Infrastructure of the collective water supply and sewage collection system in the Damnica Commune includes:*

- *water main with connections in the Strzyżyno, Dąbrówka, Wiszno, Domaradz,*
- *Święcichowo, Damnica, Mianowice and Wiatrowo localities;*
- *Damno; water treatment station in the Jeziorka locality;*
- *water sewage system connections in the Łojewo and Świtały villages;*
- *sanitary collector - Damnica (Strażacka, Parkowa and Dolna Streets), Bobrowniki, Damno;*
- *sanitary water sewage system in the Łojewo, Świtały, Święcichowo and Wiatrowo villages;*
- *sewage treatment plants in the Bobrowniki, Karżniczka and Damnica localities.*
- *rural water main with connections and water intake in the Sąborze locality used by approx. 57% of the Commune inhabitants. The value of this indicator is medium in the voivodeship scale and high comparing to the other Communes of the Słupsk Poviat.*

There are 3 sewage treatment plants operating within the Damnica Commune.

Table 3. Specification of the sewage treatment plants in the Damnica Commune.

Sewage treatment plant	User	Capacity	Workload	Input reduction					Processes	Receiver
				BOD5	COD	Total phosphorus	Total nitrogen	Total content		
		[m^3/24h]	[PE]	[%]	[%]	[%]	[%]	[%]		
Bobrowniki	Water Service Institute for Agriculture	350	949	95	93	SS	64	99	mechanical - biological	drainage ditch, Łupawa River tributary
Karżniczka	Water Service	100	264	99	97	96	78	99	mechanical	Charstnica

	Institute for Agriculture								- biological	River
Damnica	Water Service Institute for Agriculture	300	1147	82	75	36	28	83	mechanical - biological	Charstnica River

Source: Environmental Protection Programme for the Damnica Commune for 2008-2011 With 2012-2015 Perspective (2008).

In 2008, there have been 21 operating groundwater intakes within the Damnica Commune in total. The nearest of them - two water intakes - are located in the Bięcino village in a distance of approx. 800 m from the nearest planned wind power plant. Capacity of both intakes is ca. 20 m^3/h.

There is no sanitary sewage system within the area of the investment - sewage from these areas are disposed by septic tankers to the sewage treatment plant. Sewage collected in the drainless reservoirs so called septic tanks pose a potential risk to surface and groundwaters at the areas without the sewage system in the case of leakage from such tanks, which, as demonstrated in practice, is a common phenomenon, and/or sewage disposal in random places.

Pursuant to the "Environmental Protection Programme of the Damnica Commune..." (2008), the area of the commune demonstrates relatively low level of sewage management infrastructure - hardly 50% of households is connected to the sewage system. Sewage management is primarily reduced to disposal of sanitary sewage to drainless reservoirs with non-controlled emptying. Sewage from settlements are disposed to sewage treatment plants only partially.

The potential source of surface and ground waters pollution are also fertilizers, both artificial and natural, as well as chemical plant protection products used in agriculture. Improper storage results in groundwaters pollution with highly concentrated fertilizer components affecting the environment in long time perspective. In addition, these area the potential source of sanitary pollution with pathogenic organisms.

Lithospheric transformations

The essential lithospheric transformations in the area of the investment location include:

- transformations of physical and chemical properties of soils at the areas of agricultural use and potential commencement of erosion processes related primarily to the agrotechnical activities;
- transformations related to transport infrastructure, including embankments, excavations and levelling;
- geomechanical transformation areas related to adjustment of the area for investment.

Waste management

Pursuant to the "Waste management plan of the Słupsk Poviat" (2010), municipal waste from the Damnica Commune area are disposed to the Waste Disposal Plant in Bierkowo (approx. 18 km towards east from the investment area).

Within the area of the commune, municipal waste disposal is performed by two companies: Przedsiębiorstwo Gospodarki Komunalnej Sp. z o.o. in Słupsk and Przedsiębiorstwo Usług Komunalnych „ELWOZ-Woźniak" Sp. z o.o. Sierakowice.

Synanthropization and degradation of vegetation

Vegetation at the area of the investment location includes primarily the arable land agrocenoses. The most valuable components of vegetation cover in the surroundings include small forest areas, wetlands and field water basis, field tree stands and boundary strips (see chapter 3.2.2.1.). Deforestation and agricultural use of the areas have largely transformed the habitats. Transformation covered soils, including primarily the upper parts of their profiles, in which natural strata layout, including humus strata, were damaged by plough layer formation. Changes related to aeration, water retention or other composition of soil organisms, were intensified nowadays by

the use of mineral fertilisers and pesticides.
Synanthropization of meadows and pastures plant communities is related to drainage and excessive grazing as well as introduction of "noble grasses".
The most synanthropized vegetation occurs in the case of damaged soil surface near the transport infrastructure routes (road and railway routes) and technical infrastructure, at which the ruderal species are growing.

4. NATURE PROTECTION FORMS IN THE LOCATION OF THE INVESTMENT

4.1. Location of the investment

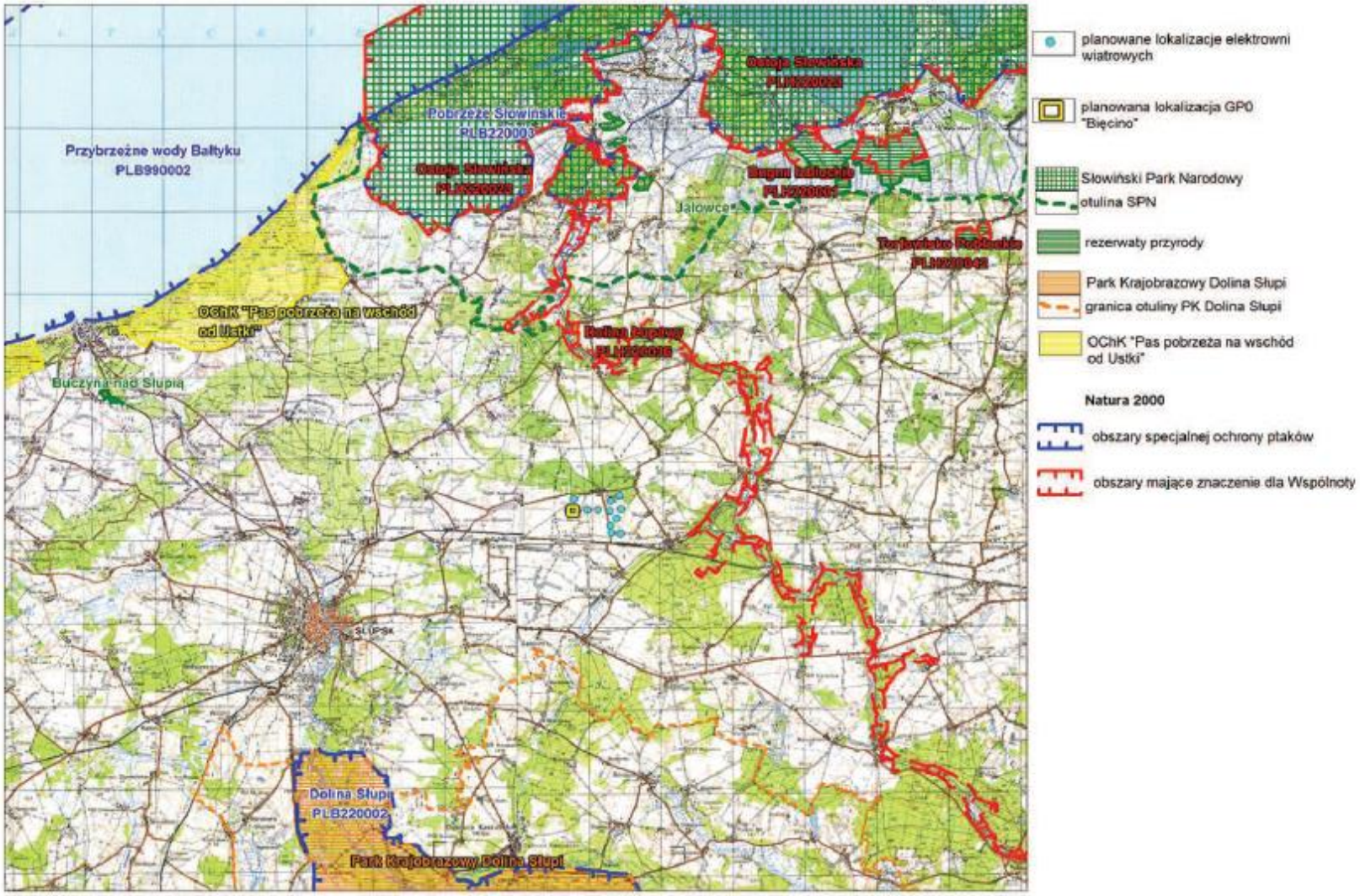
The area of the "Bięcino" wind farm is located outside the spatial forms of nature protection in the meaning of the Act on nature conservation (uniform text in Journal of Laws of 2009, No. 151, item 1220 as amended), including the amendments introduced by the Act of 13 July 2012 on amendment of the Act on nature conservation and certain other acts (Journal of Laws of 2012, item 985).
Pursuant to the Act on nature conservation, the area of the investment is subject to, so as Poland as a whole, with **species protection of flora, fauna and fungi**.
Protected species of flora, fauna and fungi, identified and that might potentially occur in the area of the "Bięcino" wind farm are described in chapter 3.2.2.
Ornithological monitoring within the investment location revealed 85 bird species. All identified bird species are protected, of which: 71 species with strict protection, 8 bird species with partial protection and 6 species with hunting protection.
Vast majority of all identified species is subject to strict or partial protection[7]. In addition, 12 from the identified species are included in Annex I to the Birds Directive (see Table 1 and **Appendix 6**).
In the scope of chiropterofauna, all five identified bat species (see chapter 3.2.2.5 and **Appendix 7**) are subject to strict protection (Ordinance of the Minister of Environment of 12 October 2011 on the fauna species protection - Journal of Laws of 2011, No. 237, item 1419).

4.2. Regional surroundings of the location of the investment

In the regional surroundings of the location of the "Bięcino" wind farm and associated infrastructure the following form of protection are localised (fig. 13):

- **Słowiński National Park - in a minimum distance of approx. 12.5 km towards north-east, from** the nearest planned location of the wind power plant (approx. 7.5 km to the Park buffer zone);
- **nature reserve**, including:
  - **"Jałowce"** - in a minimum distance of approx. 12.5 km towards north-east from the nearest planned location of the wind power plant;
  - **"Bagna Izbickie"** - in a minimum distance of approx. 17 km towards north-east from the nearest planned location of the wind power plant;
  - **"Torfowisko Pobłockie"** - in a minimum distance of approx. 18.7 km towards north-east from the nearest planned location of the wind power plant;

[7] In Poland, almost all bird species are protected (Ordinance of the Minister of Environment of 12 October 2011 on the fauna species protection - Journal of Laws of 2011, No. 237, item 1419).



Rys. 13 Położenie terenu lokalizacji zespołu elektrowni wiatrowych „Bięcino" na tle form ochrony przyrody (1:150.000)

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planowane lokalizacje elektrowni wiatrowych	planned locations of wind farms
planowana lokalizacja GPO "Bięcino"	planned location of the "Bięcino" MRP
Słowiński Park Narodowy	Słowiński National Park
otulina SPN	SNP buffer zone

rezerwaty przyrody	nature reserves
Park Krajobrazowy Dolina Słupi	Dolina Słupi (Słupia Valley) Landscape Park
granica otuliny PK Dolina Słupi	DS Landscape Park buffer zone border
OChK "Pas pobrzeża na wschód od Ustki"	Protected landscape area "Pas pobrzeża na wschód od Ustki" (Coastline towards east from Ustka)
Natura 2000	Natura 2000
obszary specjalnej ochrony ptaków	special protection areas
obszary mające znaczenie dla Wspólnoty	Sites of Community Importance
Rys. 13 Położenie terenu lokalizacji zespołu elektrowni wiatrowych „Bięcino" na tle form ochrony przyrody (1:150.000)	Fig. 13 Location of the area of the "Bięcino" wind farm against the nature protection forms (1:150 000)
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- **"Dolina Słupi" (Słupia Valley) Landscape Park** - in a minimum distance of approx. 14.8 km towards south from the nearest planned location of wind power plant (approx. 6 km to the Park buffer zone);
- **protected landscape areas:**
- **Pas Pobrzeża na Wschód od Ustki (Coastline towards East from Ustka)** - in a minimum distance of approx. 14.2 km towards north east from the nearest planned location of wind power plant;
- **Natura 2000 sites**, including:
- **special protection areas**
- **Pobrzeże Słowińskie" (Słowińskie Coastal Region) PLB220003** - in a minimum distance of approx. 12.5 km towards north from the nearest planned location of wind power plant;
- **"Dolina Słupi" (Słupia River) PLB220002** - in a minimum distance of approx. 15 km towards south from the nearest planned location of wind power plant;
- **"Przybrzeżne Wody Bałtyku" (Coastal Baltic Sea Waters) PLB990002** - in a minimum distance of approx. 18.5 km towards north from the nearest planned location of wind power plant;
- **Sites of Community Importance:**
- **"Dolina Łupawy" (Łupawa Valley) PLH220036** - in a minimum distance of approx. 3 km towards east from the nearest planned location of wind power plant;
- **"Ostoja Słowińska" (Słowińska Important Bird Area) PLH220023** - in a minimum distance of approx. 12.5 km towards north from the nearest planned location of wind power plant;
- **"Klify Poddębskie" (Poddębskie Cliffs) PLH220100** - in a minimum distance of approx. 18 km towards north west from the nearest planned location of wind power plant
- **"Bagna Izbickie" PLH22001** - in a minimum distance of approx. 18 km towards north west from the nearest planned location of wind power plant
- **"Torfowisko Pobłockie" PLH220042** - in a minimum distance of approx. 18.7 km towards west from the nearest planned location of wind power plant.
- **nature monuments** - the nearest ones, within the geodetic precinct of Karżniczka, in a minimum distance of 1.6 km towards south from the nearest planned location of the wind power plant.
- **ecological sites** - the nearest ones, in the area of Dąbrówka Lake, in a minimum distance of 9 km towards east from the nearest planned location of the wind power plant.

The Słowiński National Park[8] is located in the Baltic Sea Region, in a district of the Coastal Belt. It covers 32 744.03 ha. Due to special natural and scientific values it was announced the World Biosphere Reserve by UNESCO in 1977. The main attributes of the Park are wandering dunes, uncovering the dead forests - the remains after the tree stands strewn with sand. Sand dunes are formed of sand thrown out on the beach, dried by sun and wind and transported deeper to the land. The dunes reach 30 m of height and wander with a speed of 3 - 10 m throughout the year. The area of the Park has been a sea bay in the past, which in effect of sea activity and other geomorphological processes was completely separated from the sea with the Gardeńsko-Łebska Peninsula. In this way, shallow seaside lakes, Gardno and Łebsko, being also the European-scale particularity, were formed. A belt of post-glacial moraine hills surrounding the Par from south and west is an important landscape component. The highest peak - Rowokół - (115 m above sea level) is a viewing point covering the whole Park.

[8] Source: Central Register of nature protection forms (http://crfop.gdos.gov.pl/)

The specific natural value of the Słowiński National Park is manifested by diversified flora communities - from pioneer plants forming the natural succession sequences at the sandy beaches, such as sea sandwort or European searocket - to typical seaside, pine crowberry coniferous forest with heathers and orchids in their groundcover. The greatest share of the Park area i.e. approx. 80% is accounted for different varieties of pine coniferous forests, from dry, fresh to bog coniferous forests. There area also different types of mires in the Park: raised, transition, law and meadow mires. Flora of the Park consists in 920 vascular species, of 92 is protected e.g. sea holly growing on sand dunes, marsh clubmoss, round-leaved and great sundew, shoreweed, lake quillwort, royal fern, orchids and bog-myrtle. Location of the Park at the route of spring and autumn migrations makes this area a nesting or resting site for almost 260 bird species practically throughout the all year. The most valuable species include: white-tailed eagle, golden eagle, horned owl, common shelduck, dunlin and ringed plover. The Park is the habitat of roe deers, deers, wild boars, raccon dogs, American minks, otters and beavers. In the past, the areas of the Park were inhabited by a group of Kashubian community - the Slovincians - from whom the Park has taken its name. The Kluki locality hosts a open-air museum presenting the noteworthy past and culture of this ethnic group.

In order to protect the park against the external risks, the SNP has a delineated buffer zone.

Nature reserves[9]

"Jałowce"- established in 1984 of area of 1.29 ha. Concentration of numerous Juniperus communis specimen of diversified forms in pine tree stand on the moraine hills. 140 uniquely high Juniperus communis specimen reaching up to 8 m. Area 1.29 ha.

"Bagna Izbickie" - forest reserve located near the Łebsko Lake, of 281 ha area (established in 1982). The reserve protection covers primarily the bog birch woods and Atlantic heathlands. The are also sites of numerous protected species (among others, heather-bell, bog-myrtle, round-leaved sundew, Rhynchospora alba, bog-sedge, bog rosemary, black crowberry and marsh Labrador tea). The nearest localities are Izbica and Ciemino. Vast extension of the reserve with Atlantic heathlands from the north and south and heathland complex in the west towards the border of the Słowiński National Park. Since 2004, the reserve and its surroundings are submitted to the Natura 2000 network.

"Torfowisko Pobłockie"- raised Baltic type mire located towards west from Pobłocie and Rzuszcze localities. Established as nature reserve of 112.31 ha area in 1982. The central part of the reserve is occupied by a forest-free raised bog with heather-bell, surrounded by bog coniferous forests and communities of bog-myrtle. So called black Lake has been situated in the eastern part several dozens years ago, today vanished. The reserve suffers from excessive dryness due to establishing the drainage ditch system and drainage of surrounding meadows. The efforts of the Nature Lovers Club resulted in installation of partition walls in the ditches in 2006. In September 2006 the reserve was submitted to the Natura 2000 network.

The "Dolina Słupi" Landscape Park was established in 1981 in the area of 7 communes (Damnica, Kobylnica, Dębnica Kaszubska, Kołczygłowy, Borzytuchom, Bytów and Czarna Dąbrówka) and 2 poviats (Damnickie and Bytowski). Its area is 37 040 ha and 83 170 ha including buffer zone and covers the area of middle and lower section of the Słupia River and its basin from Soszyca to the Krępa-Łosino route.

The "Dolina Słupi" Landscape Park is the only valley park in the Pomeranian Voivodeship. Its topography was formed in the period of North-Atlantic continental glacier melting, which contributed to wide variety of landscape forms and significant

[9] Source: Central Register of nature protection forms (http://crfop.gdos.gov.pl/)

differentiation of altitudes. The specific feature of Park is its afforestation rate - as many as 72% of its area is covered by forests. The most common forest communities are fresh and mixed pine forest, small patches of which were formed on raised bogs and at the final stage of their encroaching. Decidous forests of the Park are represented by several types of communities, from which the largest areas are covered by beechwoods: acidic and fertile, river valleys are associated with alluvial forests, oak-hornbeam forests and willow shrubs.
Well-preserved parts of fully formed and more than 100 years old acidic beechwoods are found towards north from Dębnica Kaszubska and towards north and west from Kołczygłowy. Alder forests, alder-ash forests or willow shrubs cover highly fertile habitats. This is one of the flora communities of highest species diversity.
The interesting flora formations include mires with particularly valuable parts associated with raised bogs. Low mires are common in the park. This include soligenous mires formed in the sites with intensive outflow of groundwaters.
A special type of low mires are suspended spring mires. These are formed at the edges of valleys, where groundwater outflows on the surface in a form of a spring.
Lakes of different size, shape and origin are the important component of the landscape, with the lakes of the highest area: Jasień (590 ha) and Głębokie (107 ha). The lakes of the highest natural value include the lobelia lakes, assembling the relic plant species such as: water lobelia, shoreweed and quillwort. There area 10 such lakes at the Park area.

The Pas Pobrzeża na Wschód od Ustki (Coastline towards East from Ustka) protected landscape area[10]

The Coastline towards East from Ustka protected landscape area is situated in the Słowińskie Coastal Region, Damnicka Plain and Damnicka Upland meso-regions. The greatest landscape and tourist attraction is the sea coastline with beaches, sand dunes and cliffs and the whole range of coastal flora, from dune-forming sea sandwort (Honkenya peploides) to forest complexes - coastal coniferous forests and beechwoods. This area hosts also the partially spa and holiday localities: Orzechowo, Poddąbie and Rowy. The architecture monuments include the manor and church in Wytowno.

Natura 2000 sites[11]

"Pobrzeże Słowińskie" (Słowińskie Coastal Region) Special protection area PLB220003

The area protects the landscape and diversity of morphological forms observed within the Gardeńsko-Łebska Peninsula, including unique coastal barchan dunes (up to 40 m above sea level wandering with the rate of 3-10 m per annum), two largest coastal brackish lakes: Łebsko (7140 ha, maximum depth of 6.3 m) and Gardno (2468 ha, maximum depth of 2.6 m) with adjoning meadows, mires, forests and bog coniferous forests. In total, the area is composed of: main complex of the Słowiński NP (with sea waters included to the park area in 2004), complex Rowokół and the Łupawa River bed connecting Rowokół with the main complex. The inter-dune basins, so called, deflation fields, a primary flora succession is observed from the initial psammophylic communities to crowberry coniferous forest. This is an important bird area of European range E 09 (Słowiński NP). The area is entered into the list of Ramsar sites; it is also included in the Słowiński Biosphere Reserve. There are at least 25 bird species listed in Annex I to the Birds Directive, 15 species from the Polish Red Book (PRB). In the breeding period, the area is inhabited by at least 1% of domestic population (C3 and C6) of the following bird species: white-tailed eagle (PRB), golden

[10] Source: Central Register of nature protection forms (http://crfop.gdos.gov.pl/)
[11] Specification of the areas according to the standard data forms (http://natura2000.gdos.gov.pl/natura2000/).

eagle (PRB), sea eagle (PRB), eagle owl (PRB), dunlin (schinzii) (PRB), ringed plover (PRB); Montagu's harrier and black cormorant are present in a relatively high density (C7). In the migration period, at least 1% of population of the migration route (C2 and C3) of the following bird species is observed: smew (c. 2%), crane (>3%), bean goose (>4%) and goosander; greater white-fronted goos and widgeon are present in a relatively high density (C7). Limitation and in many sites discontinuation of grazing of meadows and pastures results in vanishing of lard open spaces around the two greatest coastal lakes of the Park. In effect, reduction of resting sites of birds specific for wetlands (Charadriidae) and disappearance of plant communities associated with human activity is observed. Intensive tourist pressure in the most popular sites in the Park in the beach and dunes areas damages the psammophylic plant communities and breeding sites of birds. Large fluctuations of groundwaters and non-regulated sewage management have adverse effect on the structure of lake and mire ecosystem structure (water table lowering, euthrophisation).

At the area of the "Pobrzeże Słowińskie" PLB220003 special protection area, the presence of at least 28 bird species listed in Annex I to the Birds Directive 79/409/EEC) was observed. From these species, the following are protected, in accordance with the criteria classifying the bird species and their habitats for protection in the form of the Natura 2000 sites (species graded A, B or C according to the standard data form):

- *Cygnus cygnus* whooper swan;
- *Mergus albellus (Mergellus albellus)* smew;
- *Milvus milvus* red kite;
- *Aquila chrysaetos* golden eagle;
- *Crex crex* corn crake;
- *Grus grus* crane;
- *Bubo bubo* eagle owl.

The essential threats to the natural values of the area include:

- limitation and in many sites discontinuation of grazing of meadows and pastures results in vanishing of lard open spaces around the two greatest coastal lakes of the Park; in effect, reduction of resting sites of birds specific for wetlands (Charadriidae) and disappearance of plant communities associated with human activity is observed;
- intensive tourist pressure in the most popular sites in the Park in the beach and dunes areas damages the psammophylic plant communities and breeding sites of birds.
- large fluctuations of groundwaters and non-regulated sewage management have adverse effect on the structure of lake and mire ecosystem structure (water table lowering, euthrophisation).

Delivery and operation of the wind farm in the surroundings of the area were not listed as the potential threat to the functioning of the bird area.

"Przybrzeżne Wody Bałtyku" PLB990002 (Coastal Baltic Sea Waters) Special protection area

The area covers the coastal waters of Baltic Sea of the depth between 0 and 20 m. Its borders extend at the section of 200 km from the edge of the Helski Peninsula to the Pomeranian Bay. Sea bottom is uneven with height differences reaching 3 m. 4(Bird area of European range E 80. The area is the wintering site of large volumes of 2 bird species listed in Annex I to the Council Directive 79/409/EEC: black-throated loon and red-throated loon (C7). During winter, more than 1% of the migration route population (C3) of long-tailed duck, and at least 1% of guillemot and scoter is observed. Small crustaceans dominate in the benthic fauna. Large sea mammals are rarely observed - grey seals *Phoca hispida* and ringed seals *Halichoerus grypus* and harbour porpoises

Phocaena phocaena. The essential threat are the plans of locating the wind farms in this place. Also certain forms of fishery - gillnets and longlines - can pose a threat to birds. With regard to necessary data verification, on the basis of which the special protection areas were indicated, in the years 2009-2011 a correction of database containing data on abundance of specific bird species present on the Natura 2000 sites was performed and their actual share in domestic population was estimated. Apart from verification of output data, covering correction of scientific errors consisting in the incorrect identification of species constituting the subject-matter of protection, data on abundances on the basis of available literature and performed ornithological inventories were supplemented and corrected.

The **"Przybrzeżne Wody Bałtyku" PLB990002** special protection area is the wintering site of large quantities of 2 bird species listed in Annex I to the Birds Directive (79/409/EEC) being the subject-matter of the protection in accordance with the criteria classifying the bird species and their habitats for protection in the form of Natura 2000 sites (species graded A, B or C according to the standard data form):

- *Gavia stellata* (red-throated loon);
- *Gavia arctica* (black-throated looni).

The essential threat form the area functioning are the plans of locating the wind farms in this place. Also certain forms of fishery - gillnets and longlines - can pose a threat to birds.

Delivery of wind farms listed among the threats concerns only the on-shore location of wind farms within the "Przybrzeżne Wody Bałtyku" PLB990002 Special protection area.

"Dolina Słupi" PLB220002 (Słupia River Valley) Special protection area

The area covers the basin of the central part of the Słupia River and its tributaries: Bytowa, Jutrzenka and Skotawa Rivers. It features diversified post-glacial landscape with typical forms: ribbon and kettle lakes, outwash plains and end moraine hills. Part of numerous lakes are the oligotrophic lobelia lakes. The largest lakes include: Jasień, Skotowskie and Głębokie Lake. The forests, aged 40-100, are primarily the coniferous forests with pine and mixed and deciduous forests with beech and oak. The creek valleys are overgrown with alder-ash forests. The landscape of bird area is diversified with numerous gorges and hills up to 160 m above sea level. At least 22 bird species listed in Annex I to the Birds Directive and 6 species from the Polish Red Book (PRB) are present. In the breeding period, the area is inhabited by at least 1% of domestic population (C3 and C6) of the following bird species: red kite (PRB), poorwill, sea hawk (PRB), common sandpiper, goldeneye, goosander are present; the following species are present in high abundance and relatively high density (C7): white stork, black stork, crane, green sandpiper, woodlark and red-back shrike. Numerous valuable and well preserved habitats listed in Annex I to the Habitats Directive create a mosaic. Different types of mires and alluvial forests are particularly valuable. The area of presence of 6 fauna species from Annex II, including otter. The species listed in clause 3.3. with motivation D are the species legally protected in Poland.

At the area of the "Dolina Słupi" PLB220002 special protection area, the presence of at least 22 bird species listed in Annex I to the Birds Directive 79/409/EEC) was observed. From these species, the following are protected, in accordance with the criteria classifying the bird species and their habitats for protection in the form of the Natura 2000 sites (species graded A, B or C according to the standard data form):

- *Milvus milvus* red kite
- *Haliaeetus albicilla* white-tailed eagle
- *Crex crex* cork crake
- *Grus grus* crane
- *Bubo bubo* eagle owl

- *Aegolius funereus* boreal owl
- *Caprimulgus europaeus* goatsucker
- *Alcedo atthis* common kingfisher

The key threats to the area include water pollution with municipal and agricultural waste, uncontrolled tourist and recreation pressure and settlement pressure.
Delivery and operation of the wind farm in the surroundings of the area were not listed as the potential threat to the functioning of the bird area.

Sites of Community Importance:

The nearest Natura 2000 site of Community importance to the "Bięcino" wind farm is the **"Dolina Łupawy" PLH220036** (Łupawa River Valley).
This area covers the valleys of Łupawa and Bukowina Rivers from the efflux from the Jasień Lake. The following are present within the area:

- natural, deep riverbeds of Łupawa and Bukowina Rivers
- springs and small creeks (tributaries)
- extensive alluvial areas of sub-mountainous nature Carici remotae-Fraxinetum at the valley slopes as well as oak and hornbeam forests Stellario-Carpinetum in many gorges and beechwoods Luzulo-Fagetum and Asperulo-Fagetum
- wet meadows, transition and raised bogs and dystrophic lakes in drainless areas.

The area protects 14 types of habitats listed in Annex I to the Council Directive 92/43/EEC. These include at the same time the important habitats of fauna of high diversity. The additional value is manifested by:

- mountainous and sub-mountainous nature of the river
- one of the largest concentrations of springs in the Pomerania
- large complexes of alluvial forests of sub-mountainous nature
- numerous rare and endangered plant species from the Polish Red Book
- highly numerous population of freshwater alga Hildenbrandtia rivularis confirming water purity
- valuable salmonidae species
- predatory bird habitats and habitats of wetland and meadow bird species
- picturesque landscape with extensive forest complexes

The species listed in clause 3.3. with motivation D are the species legally protected in Poland. The following potential threats to the Łupawa River valley are identified:

- hydroengineering works
- discontinued use (e.g. grazing or mowing) of meadows and soligenous mires
- intensification of forest management, tree logging, in particular at steep valley, gorge and spring area slopes
- locating of the investments causing water pollution within the area and in its vicinity.

The area of Community importance "Dolina Łupawy" PLH220036 hosts the following types of habitats listed in Appendix I to the Habitats Directive (92/43/EEC) meeting the criteria for establishment of the Natura 2000 site are present:

- (code 3140) Hard oligo-mesotrophic waters with benthic vegetation of Chara spp. *Charetea*;
- (code 3150) Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation;
- (code 3260) Water courses of plain to montane levels with the. Ranunculion fluitantis and Callitricho-Batrachion vegetation *Ranunculion fluitantis*;
- (code 3270) Rivers with muddy banks;
- (code 6410) Molinia meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion*);
- (code 6430) Tall herb fringe of the montane to alpine levels (*Adenostylion alliariae*) and riverrine communities (*Convolvuletalia sepium*);

- (code 6510) Lowland and Submontane Meadows (*Arrhenatherion elatioris*);
- (code 7140) Transition mires and quaking bogs (primarily with *Scheuchzerio-Caricetea* vegetation);
- (code 7150) Depressions on peat substrates of the *Rhynchosporion*;
- (code 7220) Petrifying springs with tufa formation *Cratoneurion commutati*;
- (code 7230) Alkaline fens;
- (code 9110) *Luzulo-Fagenion* beech forests;
- (code 9130) *Dentario glandulosae-Fagenion*, *Galio odorati- Fagenion* beech forests;
- (code 9160) Sub-Atlantic oak-hornbeam forests (*Stellario-Carpinetum*);
- (code 9190) Acidophilic oak forests (*Betulo-Quercetum*);
- (code 91D0) Bog woodland (*Vaccinio uliginosi-Betuletum pubescentis, Vaccinio uliginosi-Pinetum, Pino mugo-Sphagnetum, Sphagno girgensohnii- Piceetum* and birch-pine boreal bog forests);
- (kod 91E0) Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Salicetum albo- fragilis, Populetum albae, Alnenion glutinoso-incanae*, olsy źródliskowe);
- (code 91F0) Riparian mixed forests of Quercus robur, Ulmus laevis and Ulmus minor, Fraxinus excelsior or Fraxinus angustifolia, along the great rivers (Ulmenion minoris) (*Ficario-Ulmetum*).

In addition, from among the species meeting the criteria for establishment of the Natura 2000 site, the following fauna species listed in Annex II to the Council Directive 92/43/EEC were observed:

- from the mammal group:
  - *Castor fiber* (beaver);
  - *Lutra lutra* (otter);
- from the group of amphibians and reptiles:
  - *Triturus cristatus* (crested newt);
- from the fish group:
  - *Lampetra planeri* (brook lamprey);
  - *Lampetra fluviatilis* (river lamprey);
  - *Salmo salar* (salmon);
  - *Cobitis taenia* (goat);
  - *Cottus gobio* (European bullhead).

In the standard data form for the area no flora species listed in Annex II to the Council Directive 92/43/EEC, meeting the criteria for establishment of the Natura 2000 site were provided.

The following potential threats to the Łupawa River valley are identified (www.natura2000.gdos.gov.pl):

- hydroengineering works
- discontinued use (e.g. grazing or mowing) of meadows and soligenous mires
- intensification of forest management, tree logging, in particular at steep valley, gorge and spring area slopes
- locating of the investments causing water pollution within the area and in its vicinity.

The remaining Natura 2000 sites of Community importance are located in a greater distance from the "Bięcino" wind farm i.e. in a distance between 10 and 20 km and include:

"Ostoja Słowińska" (Słowińska Bird Area) PLH220023

The area protects the landscape and diversity of morphological forms observed within the Gardeńsko-Łebska Peninsula, including unique coastal barchan dunes (up to 40 m above sea level wandering with the rate of 3-10 m per annum), two largest coastal brackish lakes: Łebsko (7140 ha, maximum depth of 6.3 m) and Gardno (2468 ha,

maximum depth of 2.6 m) with adjoining meadows, mires, forests and bog coniferous forests. In total, the area is composed of: main complex of the Słowiński NP (with sea waters included to the park area in 2004), complex Rowokół and the Łupawa River bed connecting Rowokół with the main complex. The inter-dune basins, so called, deflation fields, a primary flora succession is observed from the initial psammophylic communities to crowberry coniferous forest. The area is covered with well preserved, typically formed and present on large areas habitats specific for coastal areas, including 26 types of habitats listed in Annex I to the Council Directive 92/43/EEC. In this area, the habitats of multiple rare and endangered species were identified, including 23 from Annex II to the Council Directive 92/43/EEC (including 8 fish species and one of more extensive populations of Linaria odora in Poland (also the species listed in Annex II to this Directive) and many protected vascular species. This area inhabits also interesting non-vertebrates, including among others leeches *Hirudinae*: *Haementria costata, Haemopsis sanguisuga, Piscicola geometra* and arachnids *Arachnidae: Arctosa sp.*, *Dolomedes fimbriatus*. The unique nature of wandering dunes is protected. The offshore part of the area is the habitat of European porpoise. This is an important bird area of European range E 09 (Słowiński NP). The area is entered into the list of Ramsar sites; it is also included in the Słowiński Biosphere Reserve. There are at least 28 bird species listed in Annex I to the Birds Directive, 11 species from the Polish Red Book (PRB). During the breeding period, the area is inhabited by at least 1% of domestic population (C3 and C6) of the following bird species: white-tailed eagle (PRB), golden eagle (PRB), sea eagle (PRB), eagle owl (PRB), dunlin (schinzii) (PRB), ringed plover (PRB); Montagu's harrier and black cormorant are present in a relatively high density (C7). In the migration period, at least 1% of population of the migration route (C2 and C3) of the following bird species is observed: smew (c. 2%), crane (>3%), bean goose (>4%) and goosander; greater white-fronted goos and widgeon are present in a relatively high density (C7). The species listed in clause 3.3. with motivation D are the species legally protected in Poland.

"Klify Poddębskie" PLH220100 (Poddębskie Cliffs)

The bird area covers the cliff and dune coast of the Baltic Sea between Orzechowo and Rowy and a part of the forest complex and parabolic dunes at its background. The cliffed coast has diversified heights ranging between 5 and 35 m above sea level. There area both sections of dead and living cliff. The cliff is formed of grey boulder clay, spit sands and early Holocene peats and fossil soils in the western part underlying the aeolian sands. The discussed coastline section forms one of the most active cliffs at the southern coast of Baltic Sea. According to archive data, the coast towards east from Ustka moved back in 1862-1938 by 150 cm (rate of approx. 2 m/year). In 1960-1978, bottom base of the cliff moved back by 32 m. The sand dune coast is relatively low, locally with well-formed initial stadiums of white and grey dunes. There are several parabolic dunes, wandering until recently, at the background of cliff. The bird area covers a relatively strongly diversified habitat spectrum, combining the oligotrophic habitats with relatively fertile beechwoods, oak-hornbeam forests and alluvial forests. In the Polish coastline scale, the bird area includes the unique structure of sea coastline with adjoining cliffed and dune sections. Special attention should be drawn on aeolian formations (wandering parabolic dunes until recently) at the background of cliff. Marine accumulation sands cover also the western part of the cliff (section between Orzechowo and Poddębie). In terms of natural habitats, a dominating role was played by acidic beechwoods communities (locally on the leeward slopes of parabolic dunes) and relatively well preserved coastal crowberry coniferous forests. White dunes and parts of their initial stadiums and grey dunes cover small areas. Communities of coniferous forests and bog birch woods are

located in the inter-dune basins formed in the deflation troughs. There area also parts of oak-hornbeam and alluvial forest habitats. The bird area is the place of living of numerous rare and endangered plant species in the region, covered with legal protection.

„Bagna Izbickie" PLH22001

This area covers the part of Łeba River ice-marginal valley filled with peat formations and cut with drainage trench and ditch network. In the past, this place has been the site of extensive peat exploitation. At present, it is covered by extensive complex of Atlantic heathlands with heather-bell, bog-myrtle shrubs and bog forests and coniferous forests. Numerous post-peat basins are the site of transition mire communities. The area is surrounded with meadow communities, partially overgrown with birch woods. The area includes also an extensive complex of Atlantic heathlands, bog coniferous and birch forests and well-developed transition mire communities (in post-peat basins). 3 types of habitats listed in Annex I to the Council Directive 92/43/EEC covering more than 80% of the total area were identified. The presence of 2 species listed in Annex II to the Council Directive 92/43/EEC were recorded although their populations are not significant. A part of the area is covered with bog-myrtle shrubs. Atlantic plant species form diversified populations. The species listed in clause 3.3. with motivation D are the species legally protected in Poland.

„Torfowisko Pobłockie" PLH220042

Dome raised bog, in vast majority afforested, although with well-preserved forest-free dome surface overgrown with bog mosses and heather on peaty soil. The forest-free surface area is surrounded by bog coniferous forests. The eastern part hosts the post-peat complex, practically entirely encroached dystrophic lakes, willow thickets and initial alder woods. Relatively well preserved raised bog with forest-free dome surface area. Preserved typical, concentric layout of natural habitats. 7 types of natural habitats listed in Annex I to the Council Directive 92/43/EEC. The value of mire natural habitats in the area is additionally increased by substantial presence of rare and typical for mires plant species (deergrass, heather-bell and bog-myrtle).

Ecological sites

The central register of nature conservation forms[12] records as ecological sites approx. 45 sites located in the Damnica commune.

Pursuant to the "Environmental protection programme of the Damnica commune..." (2008) the main areas protected as ecological sites include primarily bogs, the nearest of which is located in a distance of approx. 8.3 km towards east from the area of the location of the "Bięcino" wind farm (near Dąbrówka lake). The protected areas inlcude bogs.

Nature monuments

The nearest nature monument to the "Bięcino" wind farm is the common oak of circumference of approx. 5.5 m - located in a distance of approx. 1.6 km in the Karżniczka village at the area of the palace court.

[12] http://crfop.gdos.gov.pl

5. DESCRIPTION OF MONUMENTS PROTECTED UNDER THE REGULATIONS ON MONUMENT PROTECTION AND CARE AND ON THE PROTECTION OF THE OTHER CULTURAL HERITAGE IN THE LOCATION OF THE POWER PLANT

Immovable historic monuments

Within the location of the "Bięcino" wind farm and in its direct surroundings there area no facilities listed to the register of monuments on the basis of the provisions on the protection and care of historic monuments.

The following monuments entered into the register of monuments are located within the Commune:

a) palace complex in Bobrowniki, currently owned by Farm Frites Poland Dwa Sp. z. o. o. (bricked, built in 1864 - 65, entered into the register under the no. A - 243 of 14 April 1987), palace and park;
b) palace complex in Damnica owned by the Poviat Starosty in Słupsk, the seat of the Special School and Education Facility, (bricked - from the end of 19th century, entered into the register under the no. A-240 of 12 March 1987), palace, 1901, park, palace chapel, filial church of 1906, reg. no. A-376/S of 30 December 1999;
c) Evangelic church, currently Roman Catholic church of St. Simon and Jude Thaddeus in Damno (bricked, built in 1879, entered into the register under the no. A-372 of 11 June 1999);
d) park in Domaradz from the mid- 19th century, entered into the register under the no. A-453 of 12 April 1965;
e) park pavilion located in Domaradz, owned by private entity (bricked, built in 1854, entered into the register under the no. A-453 of 12 April 1965);
f) **palace complex in Karżniczka** owned by private entity (bricked, built in 18th - 19th century, entered into the register under the no. A-410 of 28 April 1964), palace, park;
g) palace complex in Świecichowo owned by private entity (bricked, built in the mid-19th, entered into the register under the no. A-566 of 15 February 1966), palace, park;
h) **house with arcade in Bięcino**, chessboard pattern, of 19th century, entered into the register under the no. 297 of 1 February 1961.

The nearest historical monument is the house with arcade in Bięcino dated back to 19th century situated in a distance of approx. 750 m

In addition, the Commune hosts facilities of cultural value, which were not entered into the register of monuments, and including:

a) Evangelic church, currently Roman Catholic church - filial church of Our Lady of Częstochowa in Damnica (bricked, built in 1906 - 1907, planned entrance into the register of monuments);
b) Artur von Livonius manor in Damno, classicistic, built around mid-19th century and reconstructed in 1937-40. Brick, single-storey building with mansard roof and front projection with balcony and terrace. Owned by private entity (bricked, built in 1937 - 1940, inventoried);
c) Evangelic church, currently Roman Catholic church - filial church of St. Stanislaw Kostka in Domaradz (bricked, built in 1907, inventoried);
d) palace in Łojewo (bricked, built in the 4th quarter of the 19th century, reconstructed in approx. 1914, inventoried);
e) palace - bricked in Wielogłowy, built in 1887 and reconstructed in 1910;
f) Evangelic church, currently Roman Catholic church - filial church of St. Joseph the Betrothed in Zagórzyca (bricked, built in 1844, 1903, inventoried).

In addition, pursuant to the "Study of conditions and directions of spatial development of the Damnica commune" (2010), there are 177 archaeological and conservatory protection zones recorded in the commune area, in a rank of large settlements of permanent and stable form and (in vast majority) small settlements and hutments of non-permanent and seasonal development.
The "Bięcino" wind farm is located partially (power plants 1-4 - see cartographic appendix) within the limited and partial archaeological conservatory protection.
All earthworks related to implementation of the investment within these zones require prior agreement with the Voivodeship Conservator of Monuments.

6. ENVIRONMENTAL IMPACT ASSESSMENT OF THE INVESTMENT SCENARIOS OF "BIĘCINO" WIND FARM WITH ASSOCIATED INFRASTRUCTURE IN THE BIĘCINO AND KARŻNICZKA PRECINCTS, DAMNICA COMMUNITY AND STATEMENT OF REASONS FOR THE SELECTION OF THE SCENARIO FOR IMPLEMENTATION PROPOSED BY THE APPLICANT

6.1. Introduction

The environmental impact assessment was applied to the following investment scenarios

- baseline scenario - with 13 wind power plants with turbines of maximum sound power up to 105 dB.
- alternative scenario no. 1 with 13 wind power plants with turbines of maximum sound power up to 107 dB.

The assessment of these scenarios consisted in comparative acoustic analysis (see 6.2.).

- alternative scenario no. 2 of the investment differing from the one planned for implementation with the number of planned wind power plants (18);

Assessment of this scenario consisted in performance of comparative analysis with the complex of 13 wind power plants - chapter 6.3.

6.2. Acoustic analysis of the baseline scenario and alternative scenario no. 1

6.2.1. Introduction

Acoustic (noise) analysis of the "Bięcino" wind farm aims at determination of the values and range of noise projected from the planned complex up to 13 wind power plants.

Analysis is based on the LEQ Professional v.6 programme compliant with the Polish Standard PN-ISO 9613-2 "Acoustics. Attenuation of sound during propagation outdoors".

Acoustic analysis complies with the Ordinance of the Minister of Environment of 14 June 2007 on the permissible noise levels in the environment (Journal of Laws No. 120, item 826, amended with the Ordinance of the Minister of Environment of 1 October 2012 (Journal of Laws of 2012, item 1109).

Legal conditions

The Ordinance of the Minister of Environment of 14 June 2007 on the permissible noise levels in the environment (Journal of Laws No. 120, item 826, as amended) provides for acoustic standards in force for the protected areas i.e. at the areas of housing development broken down by single-family development, housing and service development and homestead development and the areas of specific services. Pursuant to the Ordinance, the permissible noise level in the environment at the border of the areas intended for single-family housing development cannot exceed :

- L_{AeqD} = 50 dB between 6 am - 10 pm (day),
- L_{AeqN} = 40 dB between 10 pm - 6 am (night).

For the areas intended for housing and service development and homestead development, the permissible noise level in the environment is higher and amounts to:

- L_{AeqD} = 55 dB between 6 am - 10 pm (day),
- L_{AeqN} = 45 dB between 10 pm - 6 am (night).

The nature of development is determined on the basis of:

– "Local Spatial Development Plan in the Damnica Commune in the Bięcino and Karżniczka precincts" in force adopted by the Resolution No. XLVIII/331/10 of the

Damnica Commune Council on 21 April 2010.

- for the part of the existing development located within the acoustic impact of the wind power plants, it was situated outside the area of this plan pursuant to Article 115 of the "Environmental Protection Law" Act (Journal of Laws of 2001, No. 62, item 627), *shall no local spatial development plant exist, the assessments whether the area is classified as the type of areas referred to in article 113(2)(1)* [single-family, multi-family housing development, homestead development, hospitals and social aid centres, recreation centres and housing and service development], *is performed by the competent authorities on the basis of actual development and use of this and adjoining areas; the provision of Article 114(2) shall apply respectively*.

In addition, pursuant to Article 114 of this Act: *when the area can be classified to several types of areas, referred to in Article 113(2)(1), it is considered that the permissible noise levels should be determined as for the prevailing type of area*.

By the letter of 9 October 2012, the head of the Damnica Commune specified the prevailing type of development as homestead development. Detailed division of housing facilities i.e. to homestead, single-family and multi-family development, etc. is provided on the map enclosed to this letter, constituting - apart from the local spatial development plan in force - the basis for classification of development under this acoustic analysis.

Table. 4 Minimum distances of the planned "Bięcino" wind farm plants from the housing development areas.

Power plant no.	Distance [m]	Direction	Development type
1	approx. 555	North-eastern	Homestead development of Bięcino village
2	approx. 865	Northern	Homestead development of Bięcino village
3	approx. 665	Western	Homestead development of Bięcino village
4	approx. 730	Northern	Homestead development of Bięcino village
5	approx. 725	Northern	Homestead development of Bięcino village
6	approx. 500	North-western	Homestead development of Bięcino village
7	approx. 640	North-western	Homestead development of Bięcino village
8	approx. 925	North-western	Homestead development of Bięcino village
9	approx. 860	Eastern	Homestead development of Budy village
10	approx. 875	Eastern	Homestead development of Budy village
11	approx. 1115	Southern	Homestead development of Budy village
12	approx. 1025	Southern	Single-family development of Dębniczka village
13	approx. 625	Eastern	Homestead development of Dębniczka village

Source: own measurements on topographic map 1:10 000 (cartographic appendix)

Specification of the investment

The source of noise in the analysed case will be the complex of 13 wind power plants located on the lands of the Bięcino and Karżniczka villages. The planned wind farm does not adjoin directly to the protected development (cartographic appendix).

Acoustic analysis of the "Bięcino" wind farm was performed for two investment scenarios i.e. for:

- baseline scenario - with 13 wind power plants with turbines of maximum sound power of 105 dB.
- alternative scenario no. 1 with 13 wind power plants with turbines of maximum

sound power of 107 dB.
Both scenarios assume location of turbines at the height of 99.5 m above ground level.

6.2.2. Acoustic analysis of the baseline scenario

Data adopted for analysis
In order to determine the range of noise propagation for day from the planned turbines, data of equipment specified in Table 5 were entered into the LEQ Professional programme.
Table 5 Data adopted for acoustic analysis - baseline scenario, day.
Legend:
X [m], Y [m] - location of turbine in the coordinate system
Z [m] - turbine height above ground level
Pma - sound power of turbine adopted for computations
Computation data:
Point sources

No.	X[m]	Y[m]	z[n]	Pma	Symbol
1	1596.1	2882.6	99.5	105.0	PP1
2	1780.7	2365.7	99.5	105.0	PP2
3	1342.2	2377.3	99.5	105.0	PP3
4	2217.7	2404.7	99.5	105.0	PP4
5	2689.7	2418.4	99.5	105.0	PP5
6	3257.4	2810.5	99.5	105.0	PP6
7	3651.8	3031.7	99.5	105.0	PP7
8	3216.4	2361.4	99.5	105.0	PP8
9	3733.9	2425.2	99.5	105.0	PP9
10	3535.6	2035.3	99.5	105.0	PP10
11	3241.4	1700.2	99.5	105.0	PP11
12	3298.4	1337.6	99.5	105.0	PP12
13	3706.6	1289.8	99.5	105.0	PP13

Source: Leq Professional v. 6 programme
The projected strength and range of noise emitted to the environment from the planned wind farm was developed adopting the soil attenuation index G=1 (specific for porous soil[13]) and the most disadvantageous in terms of air temperature and relative humidity (air temperature: 10°C, relative humidity: 70%, sound propagation with wind) attenuation indices by atmosphere, contained entirely in the Polish Standard PN-ISO 9613-2 >Acoustics. Attenuation of sound during propagation outdoors. General computation method<. In addition, the computation model considers also noise propagation in a way as in line with the wind direction. With regard to the above, acoustic computations were performed for meteorological conditions (thermal, humidity and anemometric) which are the most disadvantageous in terms of strength and range of noise propagation.
The permissible noise level at night in the analysed area is determined by the value L_{Aeq} = 45 dB, which cannot be exceeded within the areas of the existing and planned residential buildings in the homestead, multi-family and housing and service development and by the value L_{Aeq} = 40 dB, which cannot be exceeded within the areas of the existing and planned residential buildings in the single-family development.

[13] Pursuant to the "Algorithms for road and rail noise calculations" study (2007) drawn up by the Institute for Environmental Protection and Chief Inspector of Environmental Protection: **porous soil** - *is soil covering ground surface covered with grass, trees or other green and any other ground surfaces adequate for green growth e.g. arable fields*

Analysis results

In effect of the performed analysis the images of acoustic field generated in effect of operation of 13 wind power plants of the "Bięcino" wind farm at maximum sound power of all turbines (fig. 14).

Noise propagation from the planned power plants is presented in the form of isolines of even noise level and in the form of the total of 14 noise strength computation points located at the borders of the homestead residential development in the surroundings of the wind farm

Table 6 Results of acoustic analysis - baseline scenario, day

Legend:

Computation level Z [m] - height of computation point above ground level

X[m], Y[m] - location of computation point in the coordinate system

Leq - noise level in dB in the measuring point,

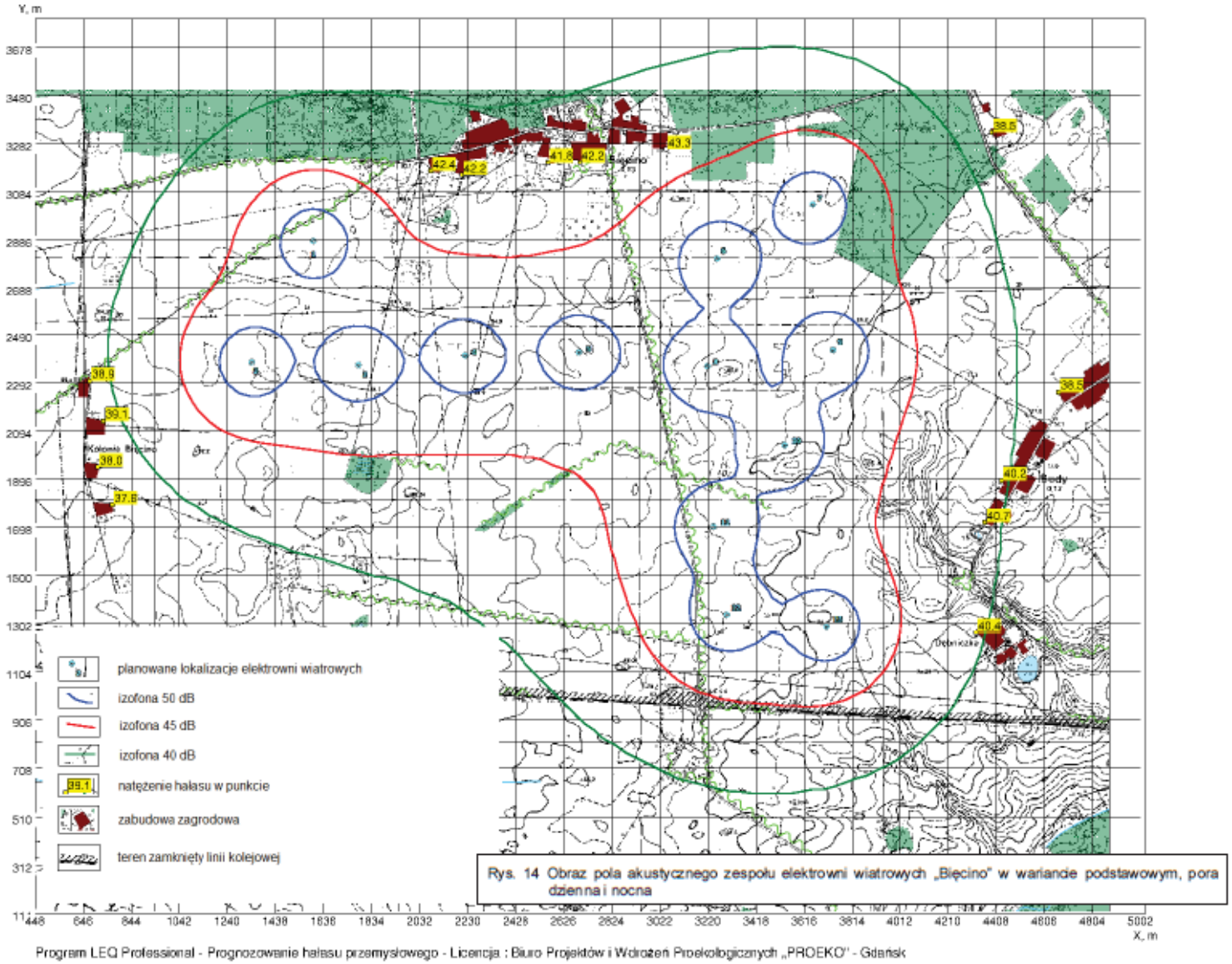
LEQ Professional 6 for Windows - result printout

No.	X [m]	Y [m]	z [m]	Leq
1	3048.6	3262.0	4.0	43.3
2	2694.3	3207.0	4.0	42.2
3	2563.6	3207.0	4.0	41.8
4	2205.8	3155.4	4.0	42.2
5	2078.6	3172.6	4.0	42.4
6	671.6	2302.2	4.0	38.9
7	730.1	2137.1	4.0	39.1
8	764.5	1793.1	4.0	37.6
9	706.0	1947.9	4.0	38.0
10	4324.9	1266.8	4.0	40.4
11	4362.7	1720.9	4.0	40.7
12	4431.5	1892.9	4.0	40.2
13	4390.2	3330.8	4.0	38.5
14	4665.4	2256.4	4.0	38.5

End of computations

Source: Leq Professional v. 6 programme

The results obtained for the baseline scenario demonstrated that in the areas of residential development the projected noise level at night will amount to L_{Aeq} = 37.6 - 43.3 dB. These results indicated that in the case of sound power L_{AW} = 105 dB, operation of the whole wind farm (13 turbines) would be possible at day and night with no restrictions (see table 6).



Rys. 14 Obraz pola akustycznego zespołu elektrowni wiatrowych „Bięcino" w wariancie podstawowym, pora dzienna i nocna

planowane lokalizacje elektrowni wiatrowych	planned locations of wind farms
izofona 50 dB	Equal loudness contour 50 dB
izofona 45 dB	Equal loudness contour 45 dB

izofona 40 dB	Equal loudness contour 40 dB
natężenie hałasu w punkcie	point noise strength
zabudowa zagrodowa	homestead development
teren zamknięty linii kolejowej	closed area of railway line
Rys. 14 Obraz pola akustycznego zespołu elektrowni wiatrowych „Bięcino” w wariancie podstawowym, pora dzienna i nocna	Fig. 14 Image of acoustic field of the "Bięcino" wind farm in baseline scenario, day and night
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6.2.3. Noise assessment of the alternative scenario no. 1

In order to compare and assess the environmental impact of both scenarios of the investment, the acoustic analysis was repeated for the alternative scenario assuming the use of turbines of greater sound power - 107 dB.

Data adopted for analysis

In order to determine the range of noise propagation **for day** from the planned turbines, data of equipment specified in Tables 7 and 8 were entered into the LEQ Professional programme.

Table 7 Data adopted for acoustic analysis - alternative scenario no. 1, day.

Legend:
X [m], Y [m] - location of turbine in the coordinate system
Z [m] - turbine height above ground level
Pma - sound power of turbine adopted for computations

Computation data:

Point sources

No.	X[n]	Y[m]	z[m]	Pma	Symbol
1	1596.1	2882.6	99.5	107.0	PP1
2	1780.7	2365.7	99.5	107.0	PP2
3	1342.2	2377.3	99.5	107.0	PP3
4	2217.7	2404.7	99.5	107.0	PP4
5	2689.7	2418.4	99.5	107.0	PP5
6	3257.4	2810.5	99.5	107.0	PP6
7	3651.8	3031.7	99.5	107.0	PP7
8	3216.4	2361.4	99.5	107.0	PP8
9	3733.9	2425.2	99.5	107.0	PP9
10	3535.6	2035.3	99.5	107.0	PP10
11	3241.4	1700.2	99.5	107.0	PP11
12	3298.4	1337.6	99.5	107.0	PP12
13	3706.6	1289.8	99.5	107.0	PP13

Source: Leq Professional v. 6 programme

In order to maintain the adequate acoustic standards, it was necessary to repeat the analysis with attenuation of power plant no. 6.

Table 8 Data adopted for acoustic analysis - alternative scenario no. 1, night.

Legend:
X [m], Y [m] - location of turbine in the coordinate system
Z [m] - turbine height above ground level
Pma - sound power of turbine adopted for computations

Computation data:

Point sources

No.	X[m]	Y[m]	z[n]	Pma	Symbol
1	1596.1	2882.6	99.5	107.0	PP1
2	1780.7	2365.7	99.5	107.0	PP2
3	1342.2	2377.3	99.5	107.0	PP3
4	2217.7	2404.7	99.5	107.0	PP4
5	2689.7	2418.4	99.5	107.0	PP5
6	3257.4	2810.5	99.5	106.0	PP6
7	3651.8	3031.7	99.5	107.0	PP7
8	3216.4	2361.4	99.5	107.0	EMS
9	3733.9	2425.2	99.5	107.0	PP9
10	3535.6	2035.3	99.5	107.0	PP10
11	3241.4	1700.2	99.5	107.0	PP11

12	3298.4	1337.6	99.5	107.0	PP12
13	3706.6	1289.8	99.5	107.0	PP13

Source: Leq Professional v. 6 programme

Analysis results

In effect of the performed analysis, the images of acoustic field generated in effect of operation of 13 wind power plants of the "Bięcino" wind farm at maximum sound power of all turbines of 107 dB (fig. 15) and setting of turbines optimised in a way to meet the noise standards for night at the border of the areas covered with noise protection (fig. 16) were obtained.

Noise propagation from the planned power plants is presented in the form of isolines of even noise level (fig. 15 and 16) and in the form of the total of 13 noise strength computation points located at the borders of the homestead residential development in the surroundings of the wind farm for both computation scenarios (table 9 and 10).

Table 9 Results of acoustic analysis - day, alternative scenario no. 1 Legend:
Computation level Z [m] - height of computation point above ground level
X[m], Y[m] - location of computation point in the coordinate system
Leq - noise level in dB in the measuring point,
LEQ Professional 6 for Windows - result printout

No.	X [m]	Y [m]	z [m]	Leq
1	3048.6	3262.0	4.0	45.3
2	2694.3	3207.0	4.0	44.2
3	2563.6	3207.0	4.0	43.8
4	2205.8	3155.4	4.0	44.2
5	2078.6	3172.6	4.0	44.4
6	671.6	2302.2	4.0	40.9
7	730.1	2137.1	4.0	41.1
8	764.5	1793.1	4.0	39.6
9	706.0	1947.9	4.0	40.0
10	4324.9	1266.8	4.0	42.4
11	4362.7	1720.9	4.0	42.7
12	4431.5	1892.9	4.0	42.2
13	4390.2	3330.8	4.0	40.5
14	4665.4	2256.4	4.0	40.5

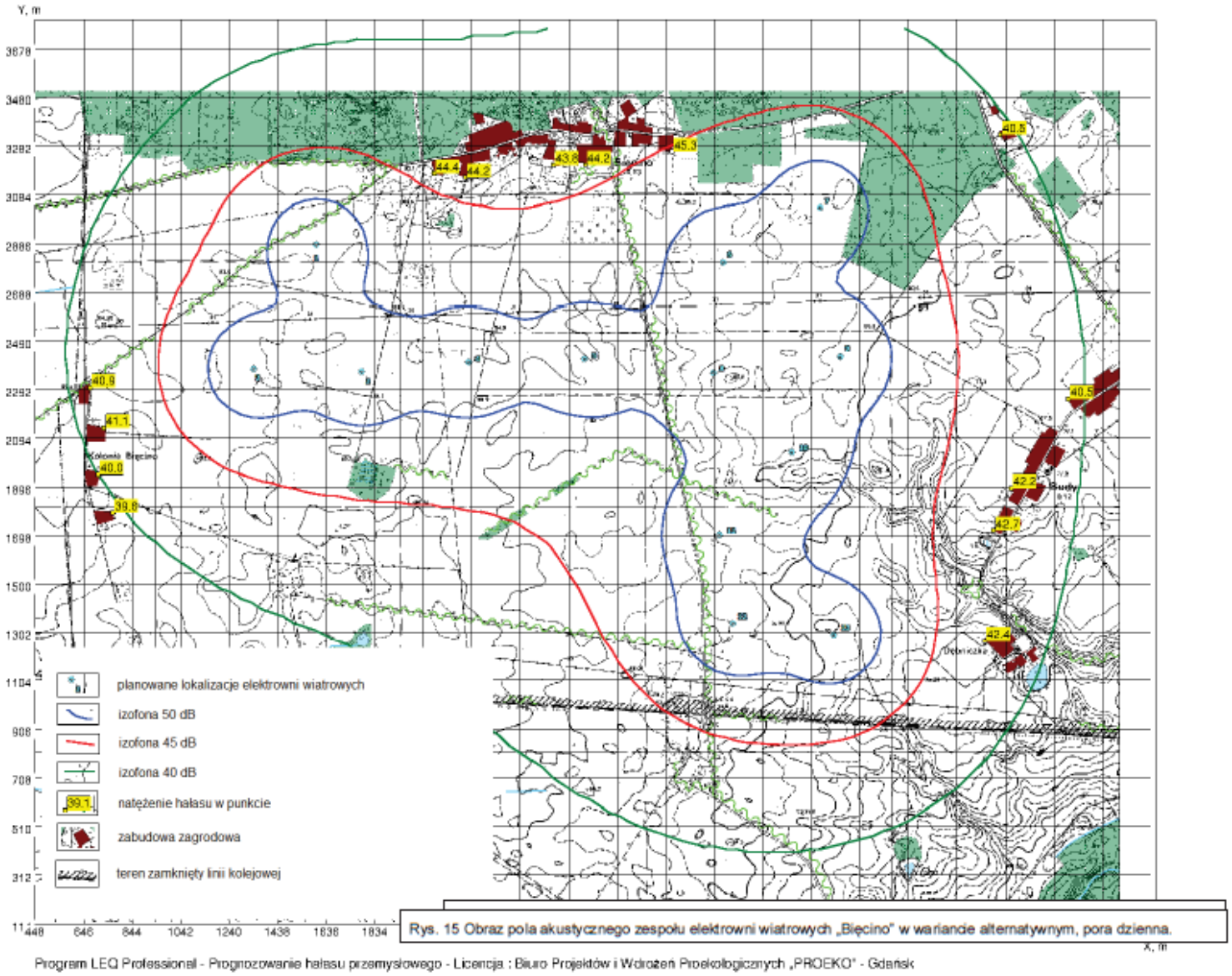
End of computations
Source: Leq Professional v. 6 programme

Table 10 Results of acoustic analysis - night, alternative scenario no. 1
Legend:
Computation level Z [m] - height of computation point above ground level
X[m], Y[m] - location of computation point in the coordinate system on fig. 13
Leq - noise level in dB in the measuring point,
LEQ Professional 6 for Windows - result printout

No.	X [m]	Y [m]	z [m]	Leq
1	3048.6	3262.0	4.0	45.0
2	2694.3	3207.0	4.0	44.0
3	2563.6	3207.0	4.0	43.7
4	2205.8	3155.4	4.0	44.1
5	2078.6	3172.6	4.0	44.3
6	671.6	2302.2	4.0	40.9
7	730.1	2137.1	4.0	41.1
8	764.5	1793.1	4.0	39.6
9	706.0	1947.9	4.0	40.0
10	4324.9	1266.8	4.0	42.4

11	4362.7	1720.9	4.0	42.6
12	4431.5	1892.9	4.0	42.2
13	4390.2	3330.8	4.0	40.4
14	4665.4	2256.4	4.0	40.5

End of computations
Source: Leq Professional v. 6 programme



Rys. 15 Obraz pola akustycznego zespołu elektrowni wiatrowych „Bięcino" w wariancie alternatywnym, pora dzienna.

planowane lokalizacje elektrowni wiatrowych	planned locations of wind farms
izofona 50 dB	Equal loudness contour 50 dB
izofona 45 dB	Equal loudness contour 45 dB

izofona 40 dB	Equal loudness contour 40 dB
natężenie hałasu w punkcie	point noise strength
zabudowa zagrodowa	homestead development
teren zamknięty linii kolejowej	closed area of railway line
Rys. 15 Obraz pola akustycznego zespołu elektrowni wiatrowych „Bięcino” w wariancie alternatywnym, pora dzienna.	Fig. 15 Image of acoustic field of the "Bięcino" wind farm in alternative scenario, day
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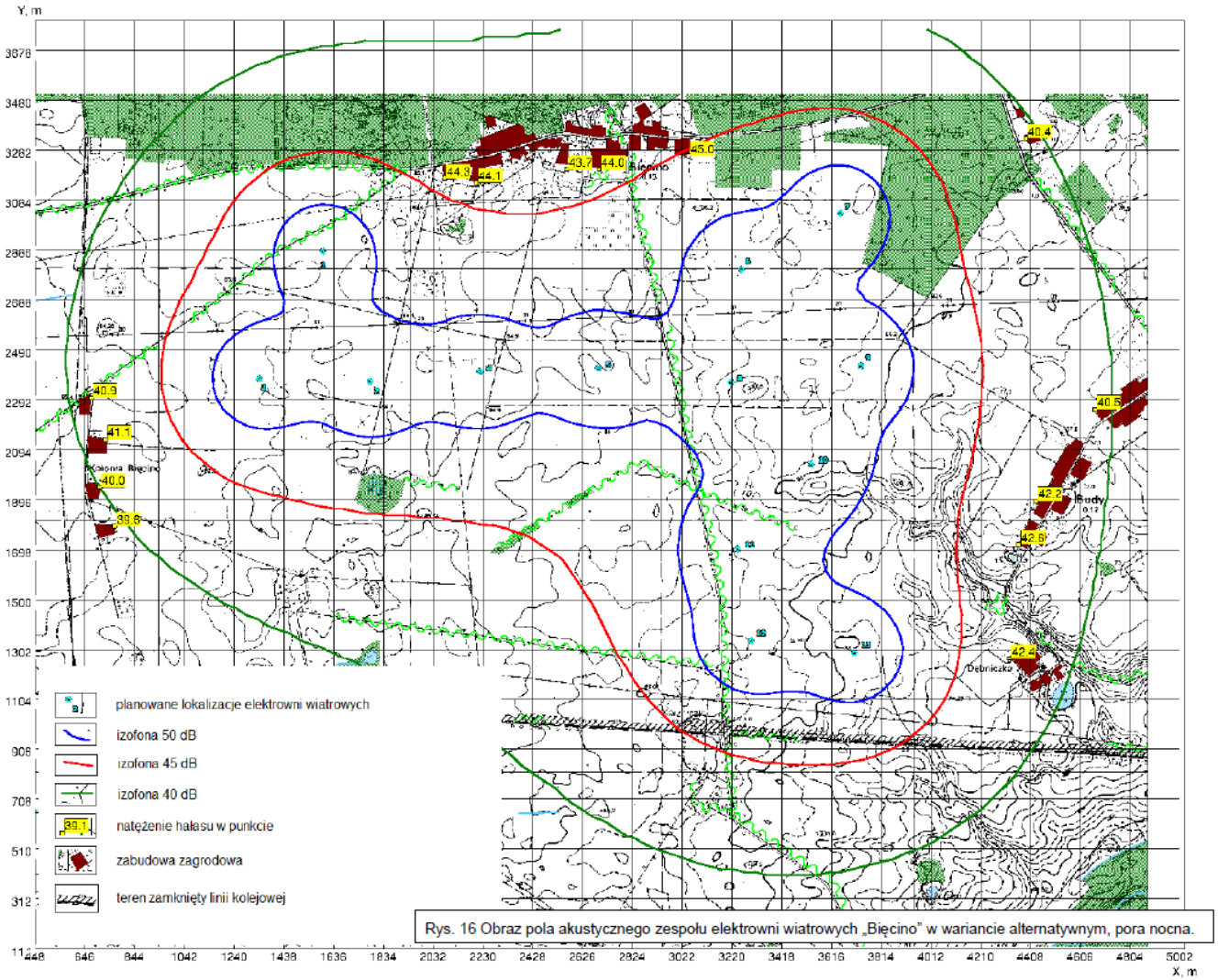

Rys. 16 Obraz pola akustycznego zespołu elektrowni wiatrowych „Bięcino" w wariancie alternatywnym, pora nocna.

planowane lokalizacje elektrowni wiatrowych	planned locations of wind farms
izofona 50 dB	Equal loudness contour 50 dB
izofona 45 dB	Equal loudness contour 45 dB
izofona 40 dB	Equal loudness contour 40 dB
natężenie hałasu w punkcie	point noise strength

zabudowa zagrodowa	homestead development
teren zamknięty linii kolejowej	closed area of railway line
Rys. 16 Obraz pola akustycznego zespołu elektrowni wiatrowych „Bięcino” w wariancie alternatywnym, pora nocna.	Fig. 16 Image of acoustic field of the "Bięcino" wind farm in alternative scenario, night
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6.3. Conclusion

The performed analysis demonstrated that from the perspective of protection of acoustic conditions regardless of the adopted scenario i.e. baseline (with the use of turbines of maximum sound power of 105 dB) or alternative (with the use of turbines of maximum sound power of 107 dB), the planned "Bięcino" wind farm can operate during the day with full sound power of all turbines.
In night in the baseline scenario, similarly as during the day, all turbines can operate with full sound power, whereas in the alternative scenario attenuation of power plant no. 6 down to 106 dB will be necessary (see table 8).
Due to necessary attenuation of turbine no. 6 in the alternative scenario **more environmentally advantageous scenario is the baseline one** using turbines of lower sound power (105 dB).
This scenario was selected for detailed environmental impact assessment (see chapter 7), leading to determination of the activities aiming at prevention or mitigation of adverse environmental impact and environmental compensation (see chapter 9).
It should be noted that the aforementioned conclusions are based on projection resulting from model computations. The aforementioned projection should be verified on the basis of actual condition of the investment determined upon its delivery on the basis of measurements performed under the post-implementation analysis (see chapter 12).
The conditions and conclusions presented in the study apply to turbines of sound power not exceeding the aforementioned value (L_{AW} = 105 dB in the scenario planned form implementation or LAW = 107 dB in the alternative scenario.

6.3. Assessment of the baseline scenario of the "Bięcino" wind farm and alternative scenario 2

The assessment was presented in tables 11 a-c, separately for the construction, exploitation and decommissioning of the "Bięcino" wind farm. Table 11a Environmental impact assessment of the scenarios of "Bięcino" wind farm - construction stage

No.	SCENARIO / IMPACTS	Baseline scenario - 13 wind power plants	Alternative scenario 2 - 18 wind power plants	Selection of the more environmentally advantageous scenario
	Lithospheric impact:			
1.	changes to area morphology (levelling, road embankments, etc.)	local, direct, irreversible changes	local changes of slightly greater territorial range, direct, irreversible	I
2.	physical transformations of sub-surface geological structure (construction excavations)	local changes of the area of approx. 6.5 ha, direct, of moderate qualitative strength, irreversible	local changes - excavation volume increased by approx. 40 %, direct, of moderate qualitative strength, irreversible	I
3.	liquidation and physical transformation of soil cover (excavations and other construction works)	local changes, direct, of high qualitative strength, irreversible	local changes of the area larger by approx. 2.5 ha, direct, of high qualitative strength, irreversible	I
4.	subsoil pollution (emergency cases)	local changes, direct, of low qualitative strength, reversible	local changes, of slightly higher probability of occurrence, direct, of low qualitative strength, reversible	I
5.	soil vibrations (construction works)	local changes, direct, of low qualitative strength, reversible	local changes, of slightly higher range of occurrence, direct, of low qualitative strength, reversible	I
	Hydrospheric impact:			
6.	subsoil pollution (emergency cases)	local changes, direct, of low qualitative strength, reversible	local changes, of slightly higher probability of occurrence, direct, of low qualitative strength, reversible	I
7.	surface water pollution (emergency cases)	local changes, direct, of low qualitative strength,	local changes, of slightly higher probability of occurrence,	I

		reversible	direct, of low qualitative strength, reversible	
	Atmospheric impact:			
8.	noise emission (construction works, transport)	local changes, direct, of moderate strength, reversible	local changes, of slightly higher range of occurrence and strength, direct, reversible	I
9.	pollution emission to air (construction works, transport)	local changes, direct, of low strength, reversible	local changes, of slightly higher range of occurrence and emission and immission, direct, reversible	I
10.	climate changes (changes to the nature of active surface)	local changes, indirect, of low qualitative strength, reversible	local changes, of slightly higher range of occurrence, indirect, of low qualitative strength, reversible	I
	Biospheric impact:			
11.	liquidation of flora and fungi (construction works)	local changes, primarily liquidation of agrocenosis flora, direct, irreversible	local changes, primarily liquidation of agrocenosis flora at the area increased by approx. 40%, direct, irreversible	I
12.	liquidation of plant habitats - primarily arable lands (construction works)	local, direct, irreversible changes	local changes, at the area increased by approx. 2.5 ha (primarily agrocenosis flora), direct, irreversible	I
13.	liquidation of soil fauna (construction works)	local changes, of low qualitative strength, direct, irreversible	local changes, of slightly higher range of occurrence, of low qualitative strength, direct, reversible	I
14.	Devaluation of surface fauna habitats (construction works)	local changes, primarily on arable lands, of low qualitative strength, direct, irreversible	local changes, primarily on arable lands, of slightly higher range of occurrence, of low qualitative strength, direct, irreversible	I
15.	Devaluation of flying animal habitats (construction works)	local changes, primarily on arable lands, of low qualitative strength, direct, reversible	local changes, primarily on arable lands, of slightly higher range of occurrence, of low qualitative strength, direct, reversible	I
	Impact on natural utility resources			
16.	soil cover loss (construction works)	local changes, at the area of approx. 6.5 ha, direct, irreversible, primarily the soils used for agricultural purposes 2. and 4. agricultural complexes	local changes, at the area increased by approx. 40%, direct, irreversible	I
	Anthropospheric impact (material heritage, including cultural)			
17.	use of technical infrastructure, including road infrastructure (construction works, transport)	local changes, of low qualitative strength, direct, reversible	local changes, of slightly higher range of occurrence, of low qualitative strength	I
18.	Waste production (construction works)	construction waste, 17 main groups (waste from construction site, renovation and disassembly of building structures and road infrastructure)	increased waste volume by approx. 40%	I
	Impact on landscape			
19.	changes to physiognomy with progressing construction works and the aforementioned impacts	local and sub-regional changes, of moderate impact strength, reversible	local and sub-regional changes, of slightly higher impact strength, reversible	I
	Human impact (on living conditions)			
20.	change to acoustic climate (noise emission - construction works and transport)	local changes, indirect, of moderate strength, reversible	local changes, direct, of slightly higher strength, reversible	I
21.	changes to aerosanitary condition (pollution immission - construction works and transport)	local changes, indirect, of low strength, reversible	local changes, of slightly higher emission and immission, indirect, reversible	I
22.	soil vibrations (construction works, transport)	local changes, indirect, of low qualitative strength, reversible	local changes, of slightly higher range of occurrence, indirect, of	I
23.	accident risk (transport)	local changes, direct, of low strength, reversible	local changes, of slightly higher probability	I
24.	landscape changes (increasing along	local changes, of moderate	local changes, of slightly higher	I

	with progress of construction works)	impact strength, reversible	impact strength, reversible	

Source: own study.

Table 11b Environmental impact assessment of the investment scenarios - exploitation stage

No.	SCENARIO / IMPACTS	Baseline scenario - 13 wind power plants	Alternative scenario 2 - 18 wind power plants	Selection of the more environmentally advantageous scenario
	Hydrospheric impact:			
1.	change to groundwater supply (territorial reduction of storm water infiltration)	local changes, direct, of low qualitative strength, reversible	local changes, of even higher range of occurrence, direct, of low qualitative strength, reversible	I
	Atmospheric impact:			
2.	noise level (operation of the power plant)	local changes, of high strength, direct, reversible	local changes, of definitely higher range and strength, direct, reversible	I
3.	infrasound emission (operation of the power plant)	local changes, of low strength, direct, reversible	local changes, of even higher range, direct, reversible	I
4.	reduced emission of pollution to atmosphere from conventional energy sources	annual emission reduction: • sulphur dioxide by approx. 123 tonnes; • nitrogen oxides by approx. 152 tonnes; • particulate matter by approx. 10.5 tonnes; • carbon dioxide by approx. 39 tonnes.	increased reduction of annual emission of pollutions listed for scenario I by approx. 40%	II
5.	climatic change (operation of the power plant and changes to active surface)	local changes, indirect, of low qualitative strength, reversible	local changes, of even higher range of occurrence, indirect, of low qualitative strength, reversible	I
	Biospheric impact:			
6.	transformations of surface fauna habitats (operation of the power plant)	local changes, direct, of low qualitative strength, reversible	local changes, of even higher range of occurrence, direct, of low strength	I
7.	transformations of flying animal habitats (operation of the power plant)	local changes, direct, of moderate qualitative strength, reversible	local changes, of even higher range of occurrence, direct, of low qualitative strength, reversible	I
8.	impact on birds (operation of the power plant and habitat transformation) a) mortality; b) reduced breeding of certain species; c) feeding site loss. impacts a) - c) can accumulate;	according to the report from the ornithological monitoring (Antczak 2010): in can be considered that the planned investment, provided that certain recommendations are followed, will constitute no excessive threat both to the local population of breeding birds and migrating birds.	This scenario was not subject to ornithological monitoring. It should be assumed that due to increased number of turbines, impact on bird fauna would be stronger.	I
9.	impact on bats (operation of the power plant and habitat transformations), impacts a) - b) can accumulate: a) mortality; b) reduced number of flights and route changes;	according to the report from the chiropterological monitoring (Kościów 2010): On the basis of the presented data it is assumed that the location of the investment will not contribute significantly to increased mortality of bats present primarily in the synurban areas, Bięcino locality and areas of Mrówczyn and Dębniczka. The planned location of the wind farm poses also no ecological barrier since no flights of bats over the fields at which the wind turbines are designed were stated.	This scenario was not subject to chiropterological monitoring. It should be assumed that due to increased number of power plants, impact on bird fauna would be stronger.	I
	Impact on natural utility resources			

10.	changes to recreation and tourist values of the location area and its surroundings	changes of local and sub-regional range, of moderate qualitative strength, indirect and accumulated, reversible	changes of local and sub-regional range, of even higher qualitative strength, indirect and accumulated, reversible	I
11.	reduced consumption of energy resources (coal, oil, gas)	production of 1 kWh of power requires 0.454 kg of hard coal, use of wind power plants proportionally eliminates this consumption	increase of the reduced consumption of energy resources by 40% comparing to scenario I	II
	Anthropospheric impact (material heritage, including cultural)			
12.	changes to the surroundings of material heritage facilities, including cultural heritage	changes of local range, indirect, of moderate qualitative strength, reversible	changes of even higher range, indirect, of moderate qualitative strength, reversible	I
13.	changes to land value (economic impact)	local changes, indirect, of low qualitative strength, reversible	changes of higher range, indirect, of low qualitative strength, reversible	I
14.	improved technical condition of the existing roads and the new road (access to power plant)	changes of local and sub-regional range, of low strength, indirect and accumulated, reversible	changes of local and sub-regional range, of higher strength, indirect and accumulated	I
15.	development of communal infrastructure (investing of the commune revenues from real-property taxes on wind farm)	local changes, of low qualitative strength, indirect	local changes, of even higher qualitative strength, indirect	I
16.	waste production (renovation works)	small volumes of waste related to maintenance works on technical equipment, including hazardous waste	volume of waste related to maintenance works on technical equipment, including hazardous waste, higher by	I
17.	reduced territorial development capacity of the other socio-economic functions, primarily settlement investing in the area of housing	changes of local and sub-regional range, of moderate qualitative strength, indirect and accumulated, reversible	changes of local and sub-regional range, of even higher qualitative strength, indirect and accumulated, reversible	I
	Impact on landscape			
18.	changes to physiognomy (impact of surface power plant elements)	changes of local and sub-regional range, of high qualitative strength, direct and accumulated, reversible	changes of local and sub-regional even higher range, of high, even higher strength, direct and accumulated, reversible	I
	Human impact (on living conditions)			
19.	change to acoustic climate (exploitation of the power plant)	local changes, within the standards in force, subject to reduction of set-points of certain	necessary greater reduction of set-points of power plant or shut-down of a few of them at night	I
20.	infrasound emission (exploitation of the power plant)	local changes, direct, of strength non-sensible by people, reversible	local changes of even higher range, direct, of strength non-sensible by people, reversible	I
21.	stroboscopic effect (exploitation of the power plant)	local changes, indirect, of low strength, absent in technologically advanced power plants	local changes, indirect, of low strength, absent in technologically advanced power plants	I/II
22.	shadow flickering effect (exploitation of the power plant)	local changes, indirect, of low qualitative strength, possible only during sunrise and sundown	local changes, of even higher range, indirect, of low qualitative strength, possible only during sunrise and sundown	I
23.	landscape transformation (presence and exploitation of the power plant)	changes of local and sub-regional range, of individual perception, indirect and accumulated	changes of even higher local and sub-regional range, of individual perception	I
24.	improved aerosanitary conditions (in effect of reduced pollution emission - clause 4)	changes of low qualitative strength, of indirect, accumulated and global nature	changes of even higher qualitative strength, of indirect, accumulated and global nature	II
25.	exploitation of roads modernised and built for the purposes of power plant	local changes, of poor qualitative strength, indirect, irreversible	local changes, of even higher qualitative strength, indirect, irreversible	II
26.	exploitation of communal infrastructure (constructed from the	local changes, of poor qualitative strength,	local changes, of even higher qualitative strength, indirect,	II

	commune revenues from real-property taxes on wind farm)	indirect, irreversible	irreversible	
27.	individual income from land lease for wind farm and associated infrastructure	local, indirect, reversible changes	local changes, of even higher strength, indirect, reversible	II

positive impacts

Source: own study.

Table 11c Environmental impact assessment of the investment scenarios - decommissioning stage

No.	SCENARIO / IMPACTS	Baseline scenario - 13 wind power plants	Alternative scenario 2 - 18 wind power plants	Selection of the more environmentally advantageous scenario
	Lithospheric impact:			
1.	physical transformations of sub-surface geological structure (excavations)	local changes, in the vicinity of the power plant foundation, MRP and cables, direct, irreversible	local changes - excavation volume increased by approx. 40 %, direct, irreversible	I
2.	liquidation and physical transformation of soil cover (excavations and other decommissioning works)	local changes, in direct vicinity of the power plant foundation, MRP and cables, direct, of high qualitative strength, irreversible	local changes of the area significantly larger in scenario I, direct, of high qualitative strength, irreversible	I
3.	subsoil pollution (emergency cases)	local changes, direct, of low qualitative strength, reversible	local changes, of even higher probability of occurrence, direct, of low qualitative strength, reversible	I
4.	soil vibration (decommissioning works)	local changes, direct, of low qualitative strength, reversible	local changes, of even higher range of occurrence, direct, of low qualitative strength, reversible	I
	Hydrospheric impact:			
5.	subsoil pollution (emergency cases)	local changes, direct, of low qualitative strength, reversible	local changes, of even higher probability of occurrence, direct, of low qualitative strength, reversible	I
6.	surface water pollution (emergency cases)	local changes, direct, of low qualitative strength, reversible	local changes, of even higher probability of occurrence, direct, of low qualitative strength, reversible	I
	Atmospheric impact:			
7.	noise emission (decommissioning works, transport)	local changes, direct, of moderate strength, reversible	local changes, of even higher range of occurrence and strength, direct, reversible	I
8.	pollution emission to air (decommissioning works, transport)	local changes, direct, of low strength, reversible	local changes, of even higher range of occurrence and emission and immission, direct, reversible	I
9.	climate changes (changes to the nature of active surface)	local changes, indirect, of low qualitative strength, reversible	local changes, of even higher range of occurrence, indirect, of low qualitative strength, reversible	I
	Biospheric impact:			
10.	liquidation of flora and fungi (decommissioning works)	local changes, in the vicinity of the power plant foundation and cables, direct, irreversible	local changes, primarily liquidation of agrocenosis flora at the area even larger than in scenario I, direct, irreversible	I
11.	liquidation of plant habitats - primarily arable lands (decommissioning works)	local changes, at the area of approx. 6.5 ha, direct, irreversible	local changes, at the area increased by approx. 2.5 ha (primarily agrocenosis flora), direct, irreversible	I
12.	liquidation of soil fauna (decommissioning works)	local changes, of low qualitative strength, direct, irreversible	local changes, of even higher range of occurrence, of low qualitative strength, direct, irreversible	I
13.	devaluation of surface fauna habitats (decommissioning works)	local changes, primarily on arable lands, of low qualitative strength, direct, irreversible	local changes, primarily on arable lands, of even higher range of occurrence, of low qualitative strength, direct, irreversible	I

14.	devaluation of flying animal habitats (decommissioning works)	local changes, primarily on arable lands, of low qualitative strength, direct, reversible	local changes, primarily on arable lands, of even higher range of occurrence, of low qualitative strength, direct, reversible	I
	Impact on natural utility resources			
15.	changes (revitalisation) to recreation and tourist values of the location area and its surroundings	changes of local and sub-regional range, of moderate qualitative strength, indirect and accumulated, reversible	changes of local and sub-regional range, of even higher qualitative strength, indirect and accumulated, reversible	I/II
	Anthropospheric impact (material heritage, including cultural)			
16.	use of technical infrastructure, including road infrastructure (decommissioning works, transport)	local changes, of low qualitative strength, direct, reversible	local changes, of even higher range of occurrence, of low qualitative strength, direct, reversible	I
17.	waste production (decommissioning works)	construction waste, 17 main groups (waste from construction site, renovation and disassembly of building structures and road infrastructure)	increased waste volume by approx. 40%	I
	Impact on landscape			
18.	changes (revitalisation) of physiognomy with progressing decommissioning works and the aforementioned impacts	local and sub-regional changes, of moderate impact strength, reversible	local and sub-regional changes, of even higher impact strength, reversible	I/II
	Human impact (on living conditions)			
19.	change to acoustic climate (noise emission - decommissioning works and transport)	local changes, indirect, of moderate strength, reversible	local changes, indirect, of even higher strength, reversible	I
20.	changes to aerosanitary condition (pollution immission - decommissioning works and transport)	local changes, indirect, of low strength, reversible	local changes, of even higher emission and immission, indirect, reversible	I
21.	soil vibration (decommissioning works and transport)	local changes, indirect, of low qualitative strength, reversible	local changes, of even higher range of occurrence, indirect, of	I
			low qualitative strength, reversible	
22.	accident risk (transport)	local changes, direct, of low strength, reversible	local changes, of even higher probability of occurrence, direct, of low strength, reversible	I
23.	landscape changes (revitalisation) (increasing along with progress of decommissioning works)	local changes, of moderate impact strength, reversible	local changes, of even higher impact strength	I/II

positive impacts

Source: own study.

6.4. Selection of more environmentally advantageous scenario

To conclude, the results of the comparative environmental impact assessment of the investment, i.e.:

- **baseline scenario - 13 wind power plants of maximum sound power of 105 dB.**
- **alternative scenario no. 1 - 13 wind power plants of maximum sound power of 107 dB.**
- **alternative scenario no. 2 - 18 wind power plants**

it should be stated that:

- at the construction state, definitely the most environmentally advantageous option will be implementation of scenario of 13 wind power plants (baseline scenario or alternative scenario no. 1);
- at the exploitation stage, the baseline scenario is more environmentally

advantageous due to acoustic impact (this scenario will require no attenuation of power plant at night in contrary to the alternative scenario, in which attenuation of power plant no. 6 to the level of 106 dB would be necessary);

- at the exploitation stage, the baseline scenario shall cause lower adverse environmental impact, although it will be partially compensated with positive direct and indirect environmental effects; the greatest adverse environmental impact will occur in effect of implementation of alternative scenario 2, specified at the same time with the greatest direct and indirect positive environmental impacts;
- at the decommissioning stage, the alternative scenario 2 shall cause greater, whereas the baseline scenario lower adverse environmental impact; environmental benefits from decommissioning of scenarios will be comparable.

Conclusion

With regard to the results of the assessment contained in chapters 6.2 and 6.3. **the baseline scenario of 13 wind power plants of maximum sound power of 105 dB was selected the most environmentally advantageous**. This scenario was selected for implementation and detailed environmental impact assessment (see chapter 7 of the "Report..."), leading to determination of the activities aiming at prevention or mitigation of adverse environmental impact and environmental compensation (see chapter 10 of the "Report...").

7. ENVIRONMENTAL IMPACT ASSESSMENT OF THE INVESTMENT SCENARIO SELECTED FOR IMPLEMENTATION

7.1. Construction stage

7.1.1. Surface lithospheric layer, including soils

Earthworks

Impact of the planned wind farm and associated infrastructure on abiotic environment will take place primarily at the investment stage lasting usually several months. Access roads and excavations for the foundations of the power plant towers and for cables will be built in this period. Excavations for foundation purposes shall liquidate the soil cover and transformations in the sub-surface geological structures in effect of earthworks and result in waste production in the form of soil excavated for the purposes of foundations and road construction (see chapter 7.1.10.).

Foundations at the depth down to 3 m below ground level are assumed, which for the planned foundation parameters (base of approx. 375 m^2, with consideration to its cone-like shape (reduced volume by approx. 50%) will result in necessary disposal - for each power plant - of approx. 810 m^3 of soil (sands and clays). This gives the value of approx. 10530 m^3 of soil for the complex of 13 wind power plants. In addition, certain amounts of soil will be produced in effect of construction of transport areas (excavations for surface construction). Soil from the excavations can be used for levelling of road areas and land management upon completion of the construction works or used in any other way

Construction excavations will be also made when laying the power and telecom cables. Soils from cable excavations will be used entirely for filling the excavations. Upon completion of works, these areas will be restored to agricultural function.

Laying of MV power cables along with optic fibre in the excavation shall require the performance of:

- excavation of the width of approx. 0.9 m and depth of approx. 1.2 m;
- periodic storage of output from excavations;
- levelling and removing stones and other objects from the excavation bottom
- sand bedding;
- laying of power cables and optic fibre pipeline in the excavation;
- filling the excavation with placement of warning tapes above the excavations.

The excavations are performed usually with the used of construction machinery (excavators). In specific cases (e.g. direct vicinity of the existing underground installations or valuable trees nearby), the excavations can be dug manually. The advantages of this method include easiness of using the bedding and securing cables as well as possibility of making the excavations at the areas with the existing underground infrastructure.

Crossings with hardened roads and utilities will be made using the jacking or controlled drill method or any other method previously agreed with the road administrator.

Soil cover

At the areas of the wind power plant, on the assembly yards around them, at the areas of transformer station and of the new roads, soil cover will be liquidated (primarily the roads classified to III or IV valuation class). This will apply to the areas of approx. 6.5 ha in total. Damage to soil cover shall also take place with regard to laying of MV power lines, provided that the routes of cable lines will be reclaimed and restored to agricultural use.

During the earthworks, the upper soil layer will be placed in a separated site in order

to be used for final reclamation of excavations and introduction of plants.
No liquidation of soil cover with regard to reconstruction of the existing roads will take place - the construction works in this scope will be performed within the existing road lanes.
During the construction of the wind farm, due to the use of heavy machinery, storage of construction materials and elements, physical transformations of the soil cover in the vicinity of the areas of direct location of the wind farm can occur. These include:

- changes to lithological structure of bedrock (sub-soil);
- liquidation of soil profile;
- change of physical structure of soil in effect of pressing with heavy construction machinery and stored material.

During the construction works the following transformations of soil cover will occur:

- liquidation of soil cover (removal of soil cover and its storage for further use upon completion of earthworks); when using the ploughing method, only the movement of surface lithospheric strata will take place; when using the non-excavation methods, i.e. drilling or jacking (under hardened roads), surface lithospheric strata will remain intact;
- transformations in sub-surface geological structures (removing soil layer from the excavation and its temporary storage on surface until the cables are laid);

Upon completion of works, the cable excavations will be filled and reclaimed.
Excessive output from the excavations (if present) will be considered waste (see chapter 7.1.10.).

Vibrations

Operation of heavy construction machinery (excavators, bulldozers, concrete nodes) can cause vibrations that will be located in the area of the conducted works and discontinued upon their completion. These can have adverse effect for the structure of the buildings and humans living therein. Their presence is however of short-term nature and applies to the area of maximum range up to several dozens of metres from the operating area of the machines. In the case of planned investment, such vibrations will occur only in the period of construction of the power plant tower foundations, provided that the nearest development - homestead development of the Bięcino village, is located in a distance of approx. 500 m from the investment area, thus vibrations caused by construction works will not affect the technical condition of the buildings.

7.1.2. Surface and ground waters

No surface water are present at the area of direct locations of the wind power plants and the planned transformer station. Construction of the wind farm and associated infrastructure shall have no impact on the hydrographic objects nearby.
Foundation works of the wind farm and transformer station will be preceded by geotechnical surveys of soil. With regard to shallow foundations of the planned power plants (approx. 3 m below ground level), no damage to the first groundwater level is projected. In the case the foundation works reach below the first groundwater level, these will be performed with the method ensuring local drainage, preventing any damage to the hydrogeological conditions and preventing drainage exceeding the area of foundations and necessary excavations e.g. the "wet" method with the use of Larsen walls or any other method.
Construction of transformer station will cause local reduction of storm water infiltration to soil. In addition, no impact on groundwaters at the construction stage is assumed.
In order to minimise the treats related to failure-based leakage of petroleum substances, the works of temporary equipment bases (construction of non-permeable surfaces) should be secured and performance of any potential equipment repairs

outside these area should be eliminated (see chapter 10).
Servicing the construction sites in the area of sanitary sewage collection shall be made with the use of mobile toilettes (toi-toi type) serviced by specialised septic companies. The volume of produced household sewage (with consideration to filling of mobile toilettes with the mixture of chemical agents neutralising impurities) is approx. 200 l/week per each 10 persons employed at the construction site. This sewage will be collected by a septic company servicing mobile toilets and disposed to sewage treatment plant.
Similarly as in the case of wind power plants and transformer station, no surface waters are present at the routes of planned MV cable line and optic fibre, in effect of which its construction shall have no impact on the hydrographic objects nearby.
Cable excavations shall be made in a significant distance from the wetlands, in effect of which the construction of MV cable lines and optic fibre shall have no impact on groundwaters.
To summarise: implementation of the planned investment shall have no impact on surface and groundwaters .
The "Water management plan within the Vistula River basin" was adopted by the Resolution of the Council of Ministers of 21 June 2011 (Polish Monitor of 2011 No. 49, item 549)
The "Plan" focuses primarily on the summary of activities contained in the National Water and Environmental Programme (NWEP). These actvities should be implemented within the basin area to ensure maintenance or improvement of all water quality by 2015 and in justified cases in the later term.
Surface waters
The area of the planned investment is located within the catchment of the Charstnica River being the Łupawa tributary:

- BSW Charstnica code PLRW2000234744;

According to the "Water management plan within the Vistula River basin" (2011) the ecological status for this body of surface water was assessed as good, whereas due to necessary prolongation of the deadline for achievement of environmental objectives and necessary subsequent environmental analysis, achieving of environmental objectives was considered as at risk.
When establishing the environmental objectives for bodies of surface water, actual condition of BSW with regard to the principle of no deterioration of water status required under the Framework Water Directive (FWD) was considered. In addition, when establishing the objectives, also the difference between natural, heavily modified and artificial bodies of water was considered. In addition, when establishing the objectives, also the difference between natural, heavily modified and artificial bodies of water was considered. For natural bodies of waters, the objective will consist in achievement of at least good ecological status, whereas for heavily modified and artificial bodies of water - of at least good ecological potential. In addition, in both cases, in order to achieve good status/potential, it will be also necessary to maintain at least good chemical status.
Groundwaters
In terms of division into body of groundwaters, the area of planned investment is located in the unit BGWd no.11 - code PLGW24011, status of which in the aforementioned "Plan..." (2011) was assessed as good and achievement of environmental objectives as not at risk.
Pursuant to Article 4 of the FWD, the following environmental objectives are established in the "Water management plan within the Vistula River basin" (2011):

- preventing inflow or reducing inflow of pollution to groundwaters;
- preventing deterioration of status of all bodies of groundwater (with restrictions

listed in the FWD);
- ensuring balance between intake and supply of groundwaters;
- implementation of the activities necessary to reverse the sustaining growing trend of concentration of each sub-solid pollutant in effect of human activity.

Impact of the planned investment

As stated in chapter 3.2.2. of the "Report..." No surface water are present at the area of direct locations of the wind power plants and the planned transformer station and at the route of MV cable lines with optic fibre". Construction of the wind farm and associated infrastructure shall have no impact on the hydrographic objects nearby. 1st level of groundwaters will be not disturbed.

Construction of wind farm and transformer station can potentially cause local and periodic reduction of storm water infiltration to soil. In addition, no impact on groundwaters at the construction stage is assumed.

Chapters 7.2.2. and 7.3.2. of the "Report..." demonstrated that operation and decommissioning of the "Bięcino" wind farm with technical infrastructure, with the use of environment friendly technologies assumed in the project, will not result in threats to surface and groundwaters.

With regard to the above, the planned investment will be neutral in context of achievement of environmental objectives specified in the "Water management plan within the Vistula River basin" (2011).

7.1.3. Atmospheric air

Impact on air pollution will result primarily from the operation of construction equipment (excavations, construction of road sections and manoeuvre yards) and transport of construction materials and soil from the output and of the construction elements of the power plant.

Vehicle traffic, excavations and storage of soil from the output and potentially of bulk construction materials will cause periodic emission of particulate matter to air. It will be of fugitive nature, of limited range, primarily to the construction site area. With a view to good airing conditions, it shall have no significant impact on the aerosanitary conditions in the area of the investment implementation.

Transport pollution

Volumes of emitted pollutions will depend on consumption of diesel oil. One consumed kg of used diesel oil will cause emission of:
- CO - 20.8 g;
- hydrocarbon mixture - 4.2 g;
- NO_2 - 15 g;
- SO_2 - 7.8 g;
- acrolein - 0.8 g.

In addition, during vehicle traffic disposing excessive soil or supplying construction material and elements, so called secondary emission of downfalling particulate matter can occur, in particular in the period of long-term draught. To reduce this emission - the road in the area of exit from the construction site should be frequently cleaned and sprinkled with water.

Due to elimination of sulphur and lead content from fuels, the assessments do not consider sulphur dioxide and lead. Therefore, the most important analysed pollutants include **nitrogen oxides, carbon oxide and hydrocarbons** and due to traffic of heavy vehicles - also particulate matter emission.

The results of calculations of the volume of transport pollution emission for the investment stage of the wind farms demonstrated that (exemplary data for the complex of 29 wind power plants - Duda 2010 - **Appendix 8**):
- maximum concentration of nitrogen oxides in the axis of the road at which the

transport to and from the wind farm construction site takes place (in the place of location of the emission source) is below 10% of permissible level;
- maximum concentration of nitrogen oxides in a distance of 10 m from the edge of the road decreases to trace values (1% of permissible level).

Maximum concentrations of the remaining pollutants (CO, C_xH_y and PM10) are negligible (far below 1% of the reference value).
According to Duda calculations (2010 - **Appendix 8**), the values of annual average concentrations from the area of the wind farm location (at the construction stage) for all transport pollutants will be of trace nature.
To summarise, calculations of all transport pollutants emitted at the construction stage from the area of the designed wind farm will be of trace nature (negligible).
Other atmospheric pollutions
Welding works will emit CO, NO_2 and particulate matter. In addition, finishing works will potentially emit C petrol, downfalling particulate matter, xylene and toluene. Impact of emission of pollutions produced during the assembly and finishing works will be practically limited to the direct vicinity of these works and shall pose no threat to the environment.

7.1.4. Acoustic climate

At the implementation stage of the investment, nuisance will be mainly caused by noise accompanying the operation of machines, excavators, cranes, mechanical tools, etc. Noise will be also generated by heavy transport supplying the elements of power plant and concrete for foundation purposes.
Exemplary noise levels (in a distance of 7 m from the operating equipment) emitted by construction equipment and machinery, on the basis of data contained in the "Database for prediction of noise on construction and open sites", developed by Helpworth Acoustics on commission of DEFRA (Department for Environment, Food and Rural Affairs) is as follows:
- removing soil layer by bulldozer - 87 dB(A);
- pneumatic hammer (e.g. in works related do demolition of concrete elements) - 90 dB(A);
- crawler-mounted excavator - 85 dB(A);
- trucks (dumpers, concrete pumps, concrete mixer trucks) - 82 dB(A).

Pursuant to the guidelines included in the Ordinance of the Minister of Economy of 21 December 2005 on the essential requirements for the equipment for outdoor use in the scope of environmental noise emission (uniform text in Journal of Laws of 2005 No. 263, item 2202 as amended, Journal of Laws of 2005, No. 263, item 2202, Journal of Laws of 2006 No. 32, item 223 and Journal of Laws of 2007 No. 105, item 718), sound power level of the equipment used in the construction industry is subject to restrictions. Pursuant to this Ordinance, sound power of individual equipment should not exceed:
- crawler-mounted dozer - 104 dB(A);
- wheel excavator, loader - 104 dB(A);
- thickening machines, pneumatic hammers - 106 dB(A);
- tower cranes - 100 dB(A).

Noise produced at the construction stage is short-term, local and will be discontinued upon completion of works. Acoustic nuisance depends on the distance from the construction site and operation time of individual equipment. Due to no detailed schedule of works and the list of construction equipment at the current stage, no detailed analysis of the construction site impact on the acoustic climate of the location can be performed.

Construction - installation - assembly works will be performed in a distance from the residential development that is:

- in a distance of approx. 500 m and more from the location of wind power plants;
- in a distance exceeding 850 m from the "Bięcino" MRP transformer station;

All construction works will be performed during the day. It is projected that the equivalent noise level outside the area of performed works, caused by operation of construction machinery and accompanying technical equipment as well as increased traffic of self-propelled vehicles and cars will cause no nuisance for the residents of surrounding residential facilities, from which the nearest are located in the Bięcino village in a distance of approx. 500 m from the nearest wind power plant (**periodic noise level during construction works is not regulated by the Polish legislation**). Considering the fact that this nuisance will be periodic and typical for construction works, it will apply only to the implementation of the investment and discontinue along with completion of works, it is stated that the periodic adverse impact on acoustic climate related to construction and assembly works will be acceptable as a temporary phenomenon typical for each construction site and cause no threat to the environment and humans.

7.1.5. Climate conditions

During the construction of the "Bięcino" wind farm, the changes to local climate conditions will occur, caused by modified nature of active surface between atmosphere and Earth along with progress of the location of construction structures and facilities.

Changes to local climate conditions will cover mainly thermal conditions (increased air temperature), humidity (decreased air relative humidity) and anemometric conditions (increased airing). These changes will be negligible for the surroundings of the constructed structures, neither for biotic environment nor for people.

In the locations of wind farm and within the assembly yards i.e. within the areas of agricultural use, the construction works will have negligible impact on the local climate conditions and this impact will be limited to changes in micro-climate scale. In the case of power plant foundations, change of surface will be permanent (power plant operating period is approx. 25 - 30 years. The areas of assembly yards, upon completion of construction works, will be reclaimed and restored to their previous function.

Planned works related to construction of the power station will have negligible impact on local climate conditions limited to changes in micro-climate scale. These will include negligible anemometric changes within the range of erected structures of station and negligible changes related to transformation of active surface within the range of power station foundations.

At the sections of planned cable lines within the areas of agricultural use, the construction works will have negligible impact on the local climate conditions - changes will be of periodic nature upon laying of cable lines the area of excavations will be reclaimed.

7.1.6. Electromagnetic radiation

During construction of the "Bięcino" wind farm, including wind power plants, transformer station and cables, no emission of electromagnetic radiation will occur.

7.1.7. Natural habitats and vegetation

Natural habitats and vegetation

At the areas of direct location of the power plants and on the assembly yards around them (max. 1000 m^2 each) and at the area of the location of power station and of the new access roads, current vegetation, represented primarily by agrocenoses of arable

lands with periodic segetal vegetation (see chapter 3.2.4.) will be liquidated, if present (we do not know the season of the year in which the construction works will be performed).
During the construction of the power plants, with regard to the use of heavy machinery and storage of construction elements, physical transformations of vegetation and its liquidation in the vicinity of the areas of direct location of the power plants (temporary assembly yards) and on the routes of excavations for cable laying and storage of excavation output can occur. For location of the power cable line using the ploughing method, liquidation of vegetation will apply to a relatively small area within the plough operating range. This will include only the arable land and ruderal vegetation.
liquidation of vegetation will also take place on the routes of MV cable connections (between the power plants and transformer station).
With regard to the course of excavations for cable lines on the routes of roads and via agricultural lands, laying of cables shall have no negative impact on the tree and shrub species in the surroundings of the investment location.
The planned MV cable connections between the wind power plants and with the subscriber transformer station MV/110 kV "Bięcino" will be delineated via the arable lands (with vegetation represented mainly by agrocenoses) and along the existing and designed roads (with accompanying ruderal vegetation).
The course of line circumvents the stands of trees and shrubs, however at this implementation stage it can occur that logging of single trees or shrubs will be necessary. In the case of stating no opportunity of circumventing non-fruit trees or shrubs aged above 10 years at the stage of construction design of the MV cable line, these will be subject to inventory, on the basis of which the investor will apply to the head of Damnica commune for permit for their logging or replanting. With a view to pursuit of the investor to minimise environmental impact, these situations will be incidental, if any.
At the entire route of the MV cable line, protection of trees growing near the excavation by means of formwork is planned. When the tree roots enter the excavation range, earthworks will be performed manually with their circumventing or with the use of any other technology approved by the competent authority.
Upon completion of investment works, the area occupied temporarily for the construction purposes (e.g. excavations for cables, storage areas) will be reclaimed (including restoration of the initial function). The locations of the planned power plants are situated within the arable lands covered with crops. There is no significant threat to trees and shrubs at the areas of the planned construction works.
Pursuant to the "Environmental inventory report for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune" study (Haplicznik, Kaszewska-Mejer, Jaśkiewicz, Szmigiel 2012) - **Appendix 4**, no protected habitats and plant species are identified within the "Bięcino" wind farm.
Complete text of flora and habitat inventory by Haplicznik, Kaszewska-Mejer, Jaśkiewicz and Szmigiel is contained in Appendix 4 constituting the integral part of this report.

7.1.8. Fauna

In the period of construction of the wind power plants, in effect of nuisance related to operation of the construction machinery (noise, exhaust fumes, vibrations, physical threat) and accesses to the construction sites, fauna will most probably migrate on temporary basis on the adjoining areas, excluding the areas easily subject to synanthropization, of high adaptation skills to changing environmental conditions (primarily certain rodent and bird species).
Field monitoring demonstrates that deterring of fauna during construction works has a range of several hundred meters from the construction sites. This is a typical periodic

impact.
At the areas of direct location of the power plants and of the new access roads, also liquidation of soil fauna will take place due to decommissioning of soil cover.
Similarly as in the case of construction of wind power plants and the MRP power station, during performance of excavations for MV power line and optic fibres, in effect of nuisance related to operation of construction machinery, fauna will most probably migrate on temporary basis to the adjoining areas, excluding species easily subject to synanthropization.
At the areas of direct location of cables (excavation areas), also a partial liquidation of soil fauna will take place due to damage to soil cover.
Pursuant to the "Environmental inventory report for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune" study (Haplicznik, Kaszewska-Mejer, Jaśkiewicz and Szmigiel 2012). In the area of the "Bięcino" wind farm, no protected animal species were identified, although the potential presence of animal species subject to species protection was stated (see chapter 3.2.5.)
In order to protect the animal species that might be potentially present within the area of the "Bięcino" wind farm, the authors of environmental inventories provided a number of recommendations that shall be applied at the construction stage of the investment:
Pursuant to the mammal, reptile and amphibian inventory (Haplicznik, Kaszewska-Mejer, Jaśkiewicz, Szmigiel 2012) - Appendix 4:
Mammals:
- *Taking out of primarily small mammals from the excavations on the on-going basis*
- *The excavations should be filled as quickly as possible to reduce the possibility of falling of animals into them. Do not leave unsecured open excavations for a longer period of time*
- *At the forest areas, it is recommended to perform works during the day and do not use lighting during night*
- *Reduction of tree logging to minimum is recommended.*

(...)
Amphibians:
- *apply nets or fences preventing falling of animals to the excavations*
- *the excavations should be filled as quickly as possible to reduce the possibility of falling of animals into them*
- *if amphibian migration during works is stated, apply nets and buckets to prevent access to the area of works to amphibians. The amphibians should be transported in accordance with the direction of their migration.*
- *if amphibian migration in the areas of planned access roads is stated, it will be necessary to continue the works in line with the herpetologist recommendations*

(...)
Reptiles:
- *the excavations should be filled as quickly as possible to reduce the possibility of falling of animals into them*
- *reptiles should be taken from the excavations on the on-going basis and under the herpetologist control.*

Pursuant to the entomofauna inventory (Haplicznik, Lasecki, Szmigiel 2012) - **Appendix 5**:
In the case of tree logging entomological supervision consisting in inventory of trees intended for logging with a view to presence of protected beetles, in particular of Osmoderma eremita, is recommended. When the beetle is present in the cut tree, the mitigating activities aiming at transfer of stated larvae and sclerities to the replacement site in line with the recommendations of supervising expert in entomology should be

taken.

7.1.9. Nature protection forms

- **Area and object forms of nature protection**

The area of the "Bięcino" wind farm location, including of the planned transformer station, is located outside the spatial forms of nature protection. The nearest spatial form of nature protection is the Natura 2000 site of Community importance **"Dolina Łupawy" PLH220036** (Łupawa River Valley) in a distance of approx. 3 km from the nearest planned locations of wind power plants and the remaining associated infrastructure.

The nearest nature monument - common oak - is located in a distance of 1.6 km towards south from the nearest palnned location of the wind power plant - in the Karżniczka village.

Due to distances and nature of the construction works, implementation of wind power plants will not impact the habitats, plant and fungi species within the Natura 2000 site "Dolina Łupawy" PLH220036 and the nature monument in the Karżniczka village.

- **Protection of habitats and species protection of flora, fauna and fungi**

Pursuant to the studies:

- "Environmental inventory report for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune" (Haplicznik, Kaszewska-Mejer, Jaśkiewicz and Szmigiel 2012) - **Appendix 4**
- "Report from entomofauna inventory for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune" (Haplicznik, Lasecki and Szmigiel 2012) - **załącznik 5**,

at the area of the "Bięcino" wind farm, no protected habitats and protected species of flora, fauna and fungi were identified.

These studies list a number of protected animal species that might be present in the location of the investment (so called "potential"). With regard to these species, numerous activities minimising the risks were established to be applied at the construction stage of the "Bięcino" wind farm - see chapter 7.1.8.

7.1.10. Waste production and utilisation

In the course of construction of the planned investment (roads, power grid, telecom grid, foundations of power plants and transformer station, power plant assembly) the construction waste, classified into group 17 according to the Ordinance of the Minister of Environment of 27 September 2001 on the catalogue of waste - Journal of Laws No. 112, item 1206 (tables 12 and 13) will be produced. Volumes of waste were estimated using the analogy method to already delivered wind farms.

Table 12 Types of waste at the construction stage of wind farms for the complex of 13 wind power plants

Waste group code	**Waste type**	**Volume** 13 wind power plants
01	**WASTE RESULTING FROM EXPLORATION, MINING AND PHYSICAL AND CHEMICAL TREATMENT OF ORES AND OTHER MINERALS**	
01 05	**drilling muds and other drilling wastes**	
01 05 99	wastes not otherwise specified	2.5 m^3 bentonite mud / m^3 drill volume

15	**WASTE PACKAGING; ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED**	
15 01	**packaging (including separately collected municipal packaging waste)**	
15 01 01	paper and cardboard packaging	13.8 m^3
15 01 02	plastic packaging	35.9 m^3
15 01 03	wooden packaging	6.4 m^3
15 01 04	metal packaging	0.43 t
15 01 05	composite packaging	0.47 m^3
15 01 06	mixed packaging waste	1.7m^3
15 02	absorbents, filter materials, wiping cloths and protective clothing	
15 02 03	absorbents, filter materials, wiping cloths and protective clothing other than those mentioned in 15 02 02	0.86 m^3
17	**CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)**	
17 01	**Construction material and element waste and road infrastructure waste (e.g. concrete, bricks, tiles and ceramics)**	
17 01 01	Concrete waste and debris from demolition and renovation works	14.1 m^3
17 01 03	Tiles and ceramics waste	5.5 m^3
17 01 07	Mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06	1.2 m^3
17 01 82	wastes not otherwise specified	1.9 m^3
17 02	**Wood, glass and plastic waste**	
17 02 01	Wood	1.9m^3
17 02 03	Plastic	1.8 m^3
17 03	bituminous mixtures, coal tar and tarred product waste	
17 03 80	Asphalt felt waste	1.8 m^3
17 04	Metals and scrap (including their alloys) waste	
17 04 05	Iron and steel	1.8 tonne
17 04 11	Cables other than those mentioned in 17 04 10	294.4 rm
17 05	**Soil (including excavated soil from contaminated sites), stones and dredging spoil**	
17 05 04	Soil and stones other than those mentioned in 17 05 03	12000 m^3 including 10530 m^3 of wind power plant foundations
17 06	**Insulation materials and asbestos-containing construction materials**	
17 06 04	Insulation materials other than those mentioned in 17 06 01 and 17 06 03	2.4 m^3

Source: own study, waste classification according to the Ordinance of the Minister of Environment of 27 September 2001 on the catalogue of waste

Table 13 Waste other than hazardous waste at the construction stage of the "Bięcino" MRP MV/110 kV

Code	Waste name	Waste production source	Estimated volume [Mg]
0801	**WASTES FROM THE MANUFACTURE, FORMULATION, SUPPLY AND USE (MFSU) OF PAINTS AND VARNISHES**		
080111*	Waste paint and varnish containing organic solvents or other dangerous substances	Waste paint and varnish used for painting of supporting structures of the station equipment and pillar painting	<0.008
080117*	Wastes from paint or varnish removal containing organic solvents or other dangerous substances	Waste paint and varnish produced during cleaning of supporting structures of the station equipment and pillar cleaning	<0.007
1303	**OIL AND LIQUID WASTE USED AS INSULATING AND HEAT TRANSMISSION OILS**		
130307*	Mineral-based insulating and heat transmission oils	Waste produced during station construction - used to supplement the transformer tanks	<0.004
15	**WASTE PACKAGING; ABSORBENTS, WIPING CLOTHS, FILTER MATERIALS AND PROTECTIVE CLOTHING NOT OTHERWISE SPECIFIED**		
150101	paper and cardboard packaging	Packaging after any equipment used for construction of the station, materials protecting the equipment against damage during transport	0.18
150102	plastic packaging	as above	0.18
150103	wooden packaging	as above	0.3
150104	metal packaging	as above	0.3
150202	Absorbents, filter materials, wiping cloths other than those mentioned in 150202	Waste produced during assembly of the station equipment	0.015
150110*	Packaging containing residues of or contaminated by dangerous substances	Packaging of paints or sorbents to be used for maintenance of supporting structure of the station equipment and pillar maintenance	0.06
150202*	Absorbents, filter materials, wiping cloths (oily cleaner)	Waste produced during construction of station and line	0.015
1605	**Gases in pressure containers and discarded**		

	chemicals		
160504*	Gases in pressure containers containing dangerous substances	SF6 waste produced during assembly of the station equipment	0.07
17	**CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)**		
170101	Concrete waste and debris from demolition and renovation works	Waste produced when laying the foundations for the station, supporting structures and pillars	0.2
170103	Tiles and ceramics waste	Ceramics will be disposed on the debris landfill by a licensed company	0.005
170107	Mixtures of concrete, bricks, tiles and ceramics	Construction debris, concrete elements and ceramics will be disposed on the debris landfill by a licensed company	0.35
170201	Wood	Wood waste produced during tree and branch cutting	0.12
170203	Plastic	Sections of control and power supply cables in the PVC insulation collected in separate containers and provided for utilisation by the specialist licensed company	0.3
170401	copper, bronze, brass	as above	0.16
170402	Aluminium	Sections of AFL aluminium and steel cables, metal elements among others damaged parts of tools and remains of casting products will be collected in the containers and disposed to the utility scrap storage site for utilisation by the specialist licensed company.	0.11
170403	Lead	Sections of control and power supply cables in the PVC insulation collected in separate containers and provided for utilisation by the specialist licensed company	0.12
170404	Zinc waste	Waste produced during construction of supporting elements of the station equipment	0.0008
170405	Iron and steel	Waste produced during construction of supporting structures	0.1

170407	Mixed metals	Waste to be produced in the construction of the station and line (endings of working cables, minor elements of supporting structures)	0.14
170411	Cables other than those mentioned in 170410	Waste to be produced during the construction of station and line - endings of cable sections	0.16
170504	Soil and stones other than those mentioned in 170503	Waste produced during earthworks, primarily these related to preparation of the foundations for the supporting structures of the station equipment, buildings and overhead line pillars	0.25
170604	Insulation materials other than those mentioned in 170601 and 170603	Insulation materials other than those mentioned in 170601 and 170603	0.18
20	**AL WASTES INCLUDING SEPARATELY COLLECTED FRACTIONS**		
200301	Non-segregated (mixed) municipal waste	Municipal waste produced by the employees working at the construction site	0.09
200121*	Fluorescent tubes and other mercury-containing waste	Waste produced in effect of consumption of lighting sources of the area of construction and assembly works	0.001

* - **hazardous** waste

Source: own study.

Vast majority of the aforementioned waste (excluding soil and ground) will be temporarily stored in the dedicated containers/tanks (located within the temporary equipment bases) which will minimise the risk of penetration of pollutants into the soil and water environment. Waste will be collected selectively. Vast majority of waste included into group 17 listed in table 13, excluding waste from 17 01 81, 17 02 03, 17 04 11 and 17 06 04, can be transferred by their holder (investor), pursuant to the Ordinance of the Minister of Environment of 21 April 2006 on the list of types of waste that can be transferred by waste holder to any natural persons or organisational units being no entrepreneurs and permissible methods of their recycling (Journal of Laws No. 75, item 527, as amended, Journal of Laws of 2008 No. 235, item 1614), to any natural persons or organisational units being no entrepreneurs for use for their own purposes (pursuant to the rules laid down in the aforementioned Ordinance).

Waste that will not be transferred to any natural persons or organisational units being no entrepreneurs for use for their own purposes, must be disposed at the cost of the Investor, to the legally operating waste landfill. Disposal must be performed by the entity holding an applicable decision of a staroste. This company shall be responsible for further storage, recycling and/or disposal of waste.

When laying the power and telecom grids, no waste production is assumed, excluding small volumes of cables provided to the specialist company for recycling and/or disposal. Soil and ground from cable laying excavations will be used entirely for filling

the excavations.
When performing controlled drilling at the passages of the cable line under the roads the drilling mud being a mixture of water and bentonite or argipol can be used. Bentonite is a natural substance, whereas agripol is a synthetic polymer subject to natural degradation. Both substances are neutral and safe for the environment.
Upon completion of drilling, the drilling mud is removed and stored for the purposes of subsequent drilling or disposed. Also the boring of high fragmentation rate is collected to duly secured metal containers and transported to landfill.
Mixture of drilling mud and output to be disposed shall contain no hazardous substances. Thus, it can be included in waste other than hazardous waste classified into the category 01 05 - drilling muds and other drilling waste of the code 01 05 99 - wastes not otherwise specified (pursuant to the Ordinance of the Minister of Environment of 27 September 2001 on the catalogue of waste - Journal of Laws No. 112, item 1206). This waste must be disposed at the cost of Investor onto a legally operating waste landfill. Disposal must be performed by the entity holding an applicable decision of a Staroste of the Słupsk Poviat or any other poviat. This company shall be responsible for further storage, recycling and/or disposal of waste.
Rules for waste handling are regulated by the Act on waste (uniform text in Journal of Laws of 2007 No. 39, item 251 as amended) and implementing legislation thereto.

7.1.11.Tangible and cultural assets

Tangible assets
Tangible assets at the area of the location of the planned investment are represented by the network of hardened roads (poviat and commune road) and ground roads, elements of technical infrastructure, and in the surroundings by rural development of diversified architectural nature and technical condition.
When constructing the "Bięcino" wind farm, it will be necessary to reconstruct and modernise part of the commune roads and other local ground roads and to construct the new assembly roads according to the designs provided in the local spatial development plans and construction designs.
Vast majority of the roads within the location of the investment have no hardened surface and are in poor technical condition. These roads will be renovated and modernised in order to secure safe access to vehicles servicing the wind farms during construction and exploitation. Modernisation shall consist primarily in the construction of the new road surface, analogically to the one planned for assembly roads. Modernised roads will remain public roads Road modernisation will be performed when the general contractor of the investment considers it necessary due to technical and safety reasons.
Access roads on private lands will form accessed to the planned wind power plants of minimum width of approx. 6 m (width of hardened surface). For the purposes of construction works, temporary roads can be built apart from access roads.
Upon completion of the wind farm construction, access roads and assembly yards will remain, whereas the areas taken for storage yards, manoeuvre yards, passings and temporary roads will be reclaimed by placement of the previously removed soil layer (restoration of agricultural function).
Access route to the location of the "Bięcino" wind farm will lead:

- from west via the city of Słupsk, followed by Siemianice or Jezierzyce;
- from east from national rad No. 6 in the area of Mianowice and further via Zagórzyca village.

Performance of excavations for power lines in the road lane will cause no deterioration of their technical condition - upon completion of the investment stage, these roads will be restored to their previous condition.

When laying the planned MV cable lines and crossing via telecom areas and technical infrastructure systems, the applicable method will be used e.g. drilling or controlled jacking method and protecting the output contacts in cooperation with the administration, administrator or owner of the other construction facility.
Detailed technical conditions in the cases of co-use of the construction facilities (e.g. road lane) or close-ups and crossings of the telecom construction facility with the other construction facilities (including among others roads) are governed by the Ordinance of the Minister of Infrastructure of 26 October 2005 on the technical conditions to be met by telecom construction facilities and their location (Journal of Laws of 2005 No. 219, item 1864 as amended).
Apart from telecom grid and technical infrastructure, the power plant construction shall have no impact on any other tangible assets. The construction of the "Bięcino" wind farm shall in particular results in no adverse impact on investment of the village in the surrounding areas.

Cultural assets

Construction of the "Bięcino" wind farm with associated infrastructure shall have no physical impact on cultural assets at the construction stage.
No objects entered into the register of monuments are found at the location of the planned investment. The nearest object entered into the register of monuments of the Pomeranian Voivodeship is located in Bięcino (house with arcade dated back to the 19th century) in a distance of approx. 750 m from the nearest planned wind power plant (see chapter 5).
At the area of the implementation of the investment (in the area of the location of wind power plants 1-4 and transformer station and on the route of MV cables), archaeological sites (parts of partial and limited archaeological and conservatorial protection) are found (see cartographic appendix).
As already mentioned, all investment works within these zones will require previous arrangements with the Voivodeship Conservator of Monuments in Gdansk.

7.1.12.Human health

Impact of the planned investment on human health shall take place at the construction stage in effect of vehicle transport of:

- output from excavations for foundations of the power plant;
- construction materials to the construction sites;
- people to the construction sites and back.

Nuisance related to vehicle transport impact, i.e. air pollution (exhaust fumes and road dust), noise, surface vibrations and risk of accidents will be limited in space (road surroundings) and time (construction period is planned for 6 - 9 months).
As demonstrated in chapter 7.1.3., calculations of all transport pollutants emitted at the construction stage from the area of the designed wind farm will be of trace nature (negligible) and will not exceed the permissible standards.
As demonstrated in chapter 7.1.4., due to distance of the construction sites, including MV cable excavations (approx. 500 m and more) from the residential housing areas and carrying out the works only during the day, noise emission related to construction stage of the "Bięcino" wind park shall cause no risk to humans and the nearest areas with noise protection.
The methods of reducing impact of the wind farm construction on human health are presented in chapter 10.
Periodic nuisance related to the investment processes are not regulated by the environmental protection legislation.

7.2. Investment exploitation stage

7.2.1. Impact on surface lithospheric layer, including soils

At the operation stage of the "Bięcino" wind farm, no impact on surface lithospheric layer, including soils, will take place.

7.2.2. Water conditions

Wind power plants

At the exploitation stage, impact of the planned "Bięcino" wind farm on water conditions will consist in local reduction of storm water infiltration to soils. This water will flow down on the surface of foundations and soak into soil in direct vicinity of the wind farm. Also discharge of storm water from the transport areas will be surface discharge to soil. Due to the nature and volume of vehicle traffic on these roads (only agricultural vehicles heading towards fields and maintenance service of the wind farm), no risk to groundwater will be present.

"Bięcino" MRP power station

Detailed requirements on the protection of water environment apply to the designed transformer station. Pursuant to the provisions of the Construction Law and the Water Law Act as well as the Polish Standard PN-E-05115, the facilities holding more than 1000 litres of petroleum substances require double protection measures. This aims at protecting the environment in the case of failure or loss of integrity of a power device. The issue of concern is discharge of storm water from the facility with simultaneous isolation of oil from natural environment.

The system protecting the facilities holding environmentally hazardous substances (such as petroleum substances) is oil sump. Double protection must catch 100% of substance. The specific case is when this sump is located outside the transformer. In such case it must also hold precipitations and fire water. Upon consideration of these factors, sump capacity should be 110-120% of liquid volume in the facility (Kucharska 2007).

The designed transformer station will be equipped in the storm water sewage system. Storm water flowing down the roof will be discharged onto the green areas nearby. Each transformer station will be equipped in tight oil sump of capacity of 110-120% of transformer oil.

Water from precipitations and thaws, accumulated in tight sumps under the transformers will flow to the separation well and to the absorbent well. To separate water and oil and discharge it, the station will be equipped in the monitoring and separation system meeting the requirements of the Polish legislation on the protection of water environment against oil pollution. Oily sludge and sediments from the separator will be collected, transported and utilised by the specialist companies holding licenses for such activity. All devices used for storm water discharge will be located within the fenced station area. These devices should enable discharge of storm water from the sumps under the transformers in the case of reference rain of strength of 150 dm3/s* ha.

MV power cables and optic fibres

MV power cables and optic fibres laid in the ground will cause local (within the laid cable) disturbances in storm water infiltration into the lithosphere at the exploitation stage. This impact will be of marginal nature.

To summarise, exploitation of the "Bięcino" wind farm with associated infrastructure shall cause no risk to surface and groundwaters.

Impact of exploitation of the "Bięcino" wind farm on delivery of the assumptions of the "Water management plan at the area of the Vistula River basin" (2011).

As demonstrated in chapter 3.2.2. of the "Report ...", no surface water are present at the area of direct locations of the wind power plants and the planned transformer station. Operation of the wind farm and associated infrastructure shall have no impact

on the hydrographic objects nearby.
With regard to the above it was assessed that the planned investment will be neutral in context of achievement of environmental objectives specified in the "Water management plan within the Vistula River basin" (2011).

7.2.3. Atmospheric air pollution

Wind power plants
At the stage of exploitation of wind power plants, no impact on atomspheric air pollution with gases, particulate matter or odours will take place.
With farms are as such the pro-environmental devices, which in general reduce emission of energy pollution to air (see chapter 2.2.).
The planned investment of the total nominal power up to 39 MW for estimated capacity of approx. 20%, is the source of approx. 68300 MWh of power per annum, which means annual reduction of emission[14]:

- sulphur dioxide by approx. 170 tonnes;
- nitrogen oxides by approx. 212 tonnes;
- particulate matter by approx. 15 tonnes;
- carbon dioxide by approx. 54 tonnes.

Operation of access roads to the wind farm will be associated with emission of transport pollution (mainly nitrogen oxides, carbon oxide and suspended matter emission).
At the exploitation stage of the wind farm, vehicle traffic is minimum (Duda 2010 - **Appendix 8**):

- 2 passenger cars / 8 hours;
- 1 truck / month.

Vehicle traffic volume at the exploitation stage is marginal (negligible).
Due to the nature and marginal volume of vehicle traffic, share of this type of pollution in general pollution balance in the location of the wind farm will be negligible.
"Bięcino" MRP power station
The station facilities will cause no emission of atmospheric air pollution at the exploitation stage.
Similarly as in the case of wind power plants, any potential air pollution will be related to service vehicles. This impact will be of marginal nature.
MV power cables and optic fibres
The cables will cause no emission of atmospheric air pollution at the exploitation stage.

7.2.4. Climate

Wind power plants
Impact of wind farm on the local climate conditions will consist primarily in reducing the wind power. Kinetic energy of wind will be transformed into mechanical energy of power-generating devices and finally into power (the core of wind power plant operation). These changes will include for the most the area of blade rotation (approx. 60-170 m above ground level).
Minor anemometric changes will take place in the vicinity of the power plant pillar, including at ground surface level.
The structures of wind farm will cause also minor drop of direct solar radiation reaching the ground surface (shading). These changes will be marginal to living organisms.
"Bięcino" MRP power station

[14] Values estimated on the basis of data published by ENERGA SA.

Similarly, as in the case of wind farms, the impact of power station on climate will refer only to minor anemometric changes within the structure of the power station.
The structures of the power station will cause also minor drop of direct solar radiation reaching the ground surface (shading). These changes will be marginal to living organisms.

MV power cables and optic fibres

At the exploitation stage, the cables shall cause on impact on climate.

7.2.5. Waste

At the exploitation stage of the "Bięcino" wind farm and associated infrastructure, no solid waste will be produced, excluding waste related to maintenance works of technical equipment.
For different types of turbines, according to the manufacturer's data, one can assume replacement of gear oil with frequency between once a year to once per several years (specific even for the individual wind power plants within the farm - whether the oil should be replaced should be agreed usually on the basis of analyses in the semi-annual cycle for gear oil and in the annual cycle for hydraulic oil). Volume of oil in a single turbine, depending on type, ranges between 60 - 90 l.
In the cases of necessary oil and filter replacement in sub-modules of turbines, hazardous waste can be produced (table 15).
Table 14 Possible types and volumes of hazardous waste for the planned "Bięcino" wind farm

No.	Waste type	Code	Waste volume per annum [1/]	Waste handling
1	mineral based non-chlorinated hydraulic oils	13 01 10*	approx. 1.4 [m^3] [2/]	transferred to waste collecting entity
2	mineral-based non-chlorinated engine, gear and lubricating oils	13 02 05*	approx. 8.6 [m^3]	transferred to waste collecting entity
3	other engine, gear and lubricating oils	13 02 08*	approx. 2.5 [m^3] [3/]	transferred to waste collecting entity
4	packaging containing residues of or contaminated by dangerous substances	15 01 10*	approx. 28.9 [m^3]	used for interim storage of waste and/or transferred to waste collecting entity
5	absorbents, filter materials (including oil filters not otherwise specified), wiping cloths, protective clothing contaminated by dangerous substances	15 02 02*	approx. 33.11 [kg]	transferred to waste collecting entity
6	discarded equipment containing hazardous components other than those mentioned in 16 02 09 to 16 02 12	16 02 13*	approx. 5.16 [kg]	transferred to waste collecting entity

Source: own study, waste classification according to the Ordinance of the Minister of Environment of 27 September 2001 on the catalogue of waste
[1/] Estimate on the basis of information from the operating wind farms.
[2/] Consumed hydraulic oils are considered waste upon performance (usually every 5 years) of the general overhaul of the hydraulic oil installation - between the WF overhauls. Minor leakages are eliminated by means of wiping cloths.

[3/] Consumed gear oils can be considered waste only in the case of unexpected loss of their properties (in standard exploitation no replacement of this oil is assumed) - WF. Minor leakages are eliminated by means of wiping cloths.

Table 15 Hazardous waste at the exploitation stage of the "Bięcino" MRP

No.	Waste name	Description	Code	Estimated volume [Mg]
1	Wastes from paint or varnish removal containing organic solvents or other dangerous substances	Maintenance of supporting structures of the station equipment shall require periodic removal of paint coating and placing a new one;	080117	0.001
2	Mineral-based insulating and heat transmission oils	Waste produced during exploitation of auto-transformers (e.g. when supplementing oil losses)	130307	0.015
3	Packaging containing residues of or contaminated by dangerous substances	Packaging of paints or sorbents to be used for maintenance of supporting structure of the station equipment and pillar maintenance	150110	0.02
4	Absorbents, filter materials, wiping cloths (oily cleaner)	Waste produced during maintenance of the station elements	150202	0.004
5	Gases in pressure containers containing dangerous substances	SF6 waste produced during maintenance and exploitation works on the station equipment;	160504	0.001
6	Fluorescent tubes and other mercury-containing waste	Waste produced in effect of consumption of lighting sources installed in the facilities of the power stations	200121	0.001
7	Oil from oil/water separators	oil from oil/water separators and oily water from oil/water separators	130506	0.02
8	Oily water from oil/water separators	as above	130507	0.05

Source: own study.

Table 16 Waste other than hazardous waste per annum at the station exploitation

stage
"Bięcino" MRP

No.	Waste name	Description	Code	Estimated volume [Mg]
1	paper and cardboard packaging	packaging after any equipment used for maintenance of the station and in the works related to failure elimination, materials protecting the equipment against damage during transport	150101	0.001
2	plastic packaging	as above	150102	0.001
3	wooden packaging	as above	150103	0.001
4	metal packaging	as above	150104	0.01
5	Absorbents, filter materials, wiping cloths other than those mentioned in 150202	Waste produced during maintenance of the station elements	150203	0.004
6	Tiles and ceramics waste	ceramic elements	170103	0.001
7	Wood	small volumes of wood waste produced during periodic tree cutting	170201	-
8	Copper and brass scrap	Waste to be produced during maintenance or repairs of the station	170401	0.01
9	Aluminium scrap	as above	170402	0.01
10	Iron and steel scrap	as above	170405	0.01
11	Cables other than those mentioned in 170410	pieces of cables that will be produced in the works related to cable failure elimination (short pieces)	170411	0.01

Source: own study.

Waste handling

Consumed oils (no. 1, 2 in table 15) and filtration materials and wiping cloths (no. 5 in table 15) in the case of necessary drawing off of oil from the installation, will be collected in tight containers (no. 4 in table 15) and transferred immediately for utilisation to the company holding the applicable permits.

Consumed fluorescent lamps (no. 6 in table 15), similarly as the aforementioned hazardous waste, will be transferred immediately for utilisation.

Collection and disposal of hazardous waste requires entering into contract with the certified company which will be responsible for its further storage, recycling and/or utilisation.

Exploitation waste (oil, greases) produced in the period of operation of the wind power plants will, upon consumption or planned replacement, be transported to the utilisation plant according to the legal procedures in force. The administrator of the planned

installation of wind power plants will not be considered a waste producer, since all maintenance and repair activities, in effect of which waste will be produced, will be conducted by a specialist external company being the entity obliged to obtain any and all applicable documents pertaining to waste management from the Słupsk Staroste. All waste will be removed from the power plant area and transferred for recycling or utilisation to the competent authority holding the permit for activity in the scope of waste management required by law.
Rules for waste handling are regulated by the Act on waste (uniform text in Journal of Laws of 2007 No. 39, item 251 as amended) and implementing legislation thereto.

7.2.6. Impact on flora

At the exploitation stage, impact of the "Bięcino" wind farm and associated infrastructure on flora will be absent.

7.2.7. Impact on fauna

7.2.7.1 Conclusions from ornithological monitoring

The results of annual ornithological monitoring is contained in the report entitled Report from the avifauna monitoring of the "Bięcino" Wind Farm (Antczak 2010), constituting the integral part of this "Report". (**Appendix 6**).
The result part of the monitoring report is presented below (Antczak, 2010):
Negative impact of the constructed wind farm on birds might be expressed by three phenomena:

- *direct risk of collisions with the operating turbines;*
- *loss or fragmentation of breeding habitats or functional areas of birds using a given area in their annual cycle;*
- *occurrence of the deterring effect.*

*In the case of the discussed area, the construction of **13** wind power plants distributed linearly on the arable fields at the area of nearly 5 km^2.*
On the basis of literature data it can be stated that intensification of the collisions with the operating turbines depends largely on spatial location of these devices. According to the experiences gained on farms built in different parts of the continent (Lucas 2007), the risk level increases along with density of the installed turbines and their linear distribution.
Frequent collisions can also occur on the important migration routes, e.g. along wide river valleys, on the coastal regions or in the passes and straits. In such places, the birds use frequently a narrow migration corridor having in most cases no opportunity to adjust it. Locating the farms in the disassemble areas of birds from the roost sites or places of assembly of large flocks resting during migrations.
Potential collisions with the operating turbines apply mainly to the birds flying in the range of turbine operation. Due to no detailed models estimating the risk of collision from Poland, at the current stage it is difficult to make such estimates for specific locations. Only data collected in the post-implementation monitoring according to a specific standard can provide actual information on the bird mortality rate. The forecasting models estimating the risk of collision based on mechanical models (e.g. Tucker 1996, Band et al. 2007) continue to be discussed in the environment and require specification, thus these were excluded from further considerations.
Analysis of a potential impact of the planned wind farm on birds is presented in descriptive form due to absence of well-established standards of the collision estimation assessments, most frequently the opportunity of its adjustment. Locating the farms in the disassemble areas of birds from the roost sites or places of assembly of large flocks resting during migrations.
Potential collisions with the operating turbines apply mainly to the birds flying in the

range of turbine operation. Due to no detailed models estimating the risk of collision from Poland, at the current stage it is difficult to make such estimates for specific locations. Only data collected in the post-implementation monitoring according to a specific standard can provide actual information on the bird mortality rate. The forecasting models estimating the risk of collision based on mechanical models (e.g. Tucker 1996, Band et al. 2007) continue to be discussed in the environment and require specification, thus these were excluded from further considerations.

Analysis of a potential impact of the planned wind farm on birds is presented in descriptive form due to absence of well-established standards of the collision estimation assessments.

At the area of the planned BIĘCINO wind farm no strong flight stream that would deviate from average values recorded in the other parts of the Pomerania was noted. Average number of migrating birds on transitory basis in spring amounted to 49.3 individual/hour (between 0 and 144.6 individual/hour during the individual counts) and in summer and autumn to 20.6 individual/hour (between 0 and 106.0 individual/hour during the individual counts). The area assembled also no larger birds resting or feeding during seasonal migrations e.g. swans, geese, cranes or plovers.

Pairs of cranes have been regularly observed within the farm area territorially associated with it and the largest non-breeding group amounted to 15 individuals, which is normal for territorial expansion of the species combined with settlement in the agricultural landscape. In spring and autumn, the fields were the resting sites for the groups of pewits amounting to even 180 individuals, sometimes accompanied by several/several dozens of golden plovers. Both species are also included into permanent components of agricultural landscape in the periods of seasonal migrations (Meissner et al. 2006). No larger flocks resting or feeding were recorded for the other non-passerine species.

In the case of birds nesting within the area, potential impact is more diversified - it is certain that part of lark, meadowlark, quail and other species nesting on fields will be lost, however one should emphasize that these species are common and widely spread in the agricultural landscape. In addition, a group of species associated with tree and shrub stands, wetlands, tree alleys and lanes, should not react negatively on the construction of wind power plants, provided that certain recommendations will be applied. Such areas should be protected against damage i.e. access roads, if using the existing field road network, should consider preservation of tree alleys and lanes, minor tree stands and field water reservoirs in possibly natural and intact state.

Considering that the newly-developed infrastructure will be distributed in accordance with the proposal of activities minimising the negative effect, one should assume that the group of species associated with the habitats specified above will remain in good shape.

In the case of wind farms, a particular focus should be put on the group of raptors, since these birds do not avoid such investments (no deterring effect), willingly hunting or flying between the turbines. This can in effect result in the increased risk of collision with the operating turbines. The most numerous and most frequently recorded buzzard can be at risk of collision or lost of part of hunting territory, however in the case of this species, due to it high abundance and commonness, the investment will have no impact on the advantageous situation of this species. Similar situation applies to marsh harrier, one pair of which nests outside the buffer zone (more than 2 km from the borders of the location), however hunts on arable lands on regular basis. In recent years, these birds have been the second most numerous raptor in the agricultural landscape of the Pomerania, in effect of which it is commonly found at many areas. In addition, in this species the birds (primarily males) can search for food even in a distance up to 7 km from nest (Hardey et al. 2006), which significantly increases the

range of penetration of the area. On the other hand, the harriers hunt practically strictly above the ground, flying at greater heights only when pairing (mating flights). Thus it can be assumed that these birds are at low risk of direct collisions and preservation of breeding sites will certainly not result in leaving the area after the investment is delivered. The last raptor species observed within the area on more regular basis was sparrowhawk - also non-endangered species, occurring irregularly and rather associated more with the forest complexes located towards north from Bięcino and constituting the core hunting territory of this species. Rough-legged buzzard was observed regularly during migrations and wintering, although these have always been the single species. The remaining species (red kite, Montagu's harrier and kestrel) were observed sporadically (1-2 records). To summarise, it should be stated that also in this scope the analysed location of the investment will pose no significant risk (threat) to avifauna.

Among the remaining species associated with the area of the planned investment, one should focus on representatives of avifauna endangered in any manner i.e. included into the Polish Red Book of Animals and Annex 1 to the Birds Directive (fig. 3).

White stork - in Bięcino and Damnica 2 occupied nests were observed, although storks were observed only three times in the area. It can be assumed that the birds from a pair nesting in Bięcino have nested near the development with parts of meadows and wastelands. Due to these reasons and minor abundance of the local population, the impact of the planned farm on storks should be considered negligible.

Marsh harrier - discussed above.

Crane - 2 pairs are associated with the investment area. One should assume that leaving the breeding sites (field water reservoirs in the area and in the surroundings) should not cause deterioration of the species condition in local scale, in particular because this species has been a permanent component of agricultural landscape of the northern Poland for several years and its status is not endangered anyhow.

Black woodpecker nested in the forest complex near Bięcino and was closely associated with the forest complex and hardly present on fields (presence confirmed by voices).

Woodlark and red-backed shrike (two and three pairs, respectively) nested within the area. These species are closely associated with the coastal zone (woodlark) or shrubs and lanes with rich and low shrubs (red-backed shrike). Both types of habitats were proposed for exclusion from the location of turbines, in effect of which situation of these species should not deteriorate.

The remaining not listed species included in Annex I to the Birds Directive or in the Polish Red Book of Animals have nested neither within the area of the planned investment nr in its direct surroundings, and low volume of observations and low abunances recorded in the non-breeding period did not deviate from any other part of the agricultural landscape in Pomerania.

To conclude, it can be stated that the planned investment, subject to meeting of the specific recommendations, shall constitute no extraordinary risk both to local group of breeding birds and migrating birds.

Complete text of ornithological monitoring by Antczak (2010) is provided in Appendix 6 constituting the integral part of this "Report".

The conclusions presented in the ornithological monitoring by Antczak (2010) shall be verified under the post-implementation monitoring (see chapter 12).

7.2.7.2 Conclusions from chiropterological monitoring

The reports from the chiropterological monitoring are contained in the "Report and assessment of the potential impact of the planned location of the "Bięcino" Wind Farm on bats" (Kościów 2010), quoted in full wording as Appendix 7 constituting the integral part of this "Report...".

According to the results of the chiropterological monitoring (Kościów 2010):
The presence of 5 common bat species abundant throughout the entire Poland was stated within the monitored area. The number of observed bat species is below the estimated value and below the average number of bat species observed to this time in the Central Pomerania, e.g. at the protected areas ("Dolina Słupi" Landscape Park).
Total abundance of stated bats, estimated on the basis of frequency of observations/detections of bats, ranged between 15 and 61 individuals. Total number of 180 observations on 61 sites was recorded. Among the total number of the identified individuals, only 10.4% of individuals were observed in the area of the investment, specifically at the border of the wind farm, which for sectors S7 and S8 was the lime tree alley at the field road between Bięcino and Karżniczka.
Frequency of observations of individual bat species enabled for determination of 61 bat sites forming 5 areas of relatively frequent presence of bats. All these areas of relatively frequent presence of bats were situated primarily outside the areas of the planned location of the wind farm or near the border of the planned location of the farm in a distance of 400 m from the nearest wind turbines.
From among 5 determined areas of relatively frequent presence of bats, only two should be marked as significant for the bat population within the planned location of the wind farm (forest complex near Mrówczyn and development of Dębniczka village). These areas are however of local importance. Location of wind farm and in particular of individual wind turbines shall pose no threat to these facilities.
On the basis of the results presented above it is estimated that in the area of the planned location of the wind farm, distances sufficient for effective buffering of the potential impact of wind turbines on bats - the risk of barotrauma or direct collisions of bats with wind turbines - are maintained.
The planned location of the wind farm analysed there shall not expose the bats on loss of habitats used by them within the monitored area, since vast majority of these habitats is located outside the investment location (only in two cases, at the border of the wind farm in a distance of 400 m from the nearest turbine).
On the basis of the presented data it is assumed that the location of the investment will not contribute significantly to increased mortality of bats present primarily in the synurban areas, Bięcino locality and areas of Mrówczyn and Dębniczka. The planned location of the wind farm poses also no ecological barrier since no flights of bats over the fields at which the wind turbines are designed were stated.
Impact assessment on consistency and correct functioning of the Natura 2000 sites in the scope of impact on bats is presented in chapter 8.1.
Complete text of monitoring of impact of the location of "Bięcino" wind farm on bats (Kościow 2010) is contained in Appendix 7, constituting the integral part of this "Report...".
The conclusions presented in the chiropterological monitoring by Kościow (2010) shall be verified under the post-implementation monitoring (see chapter 12).

7.2.7.3 Other fauna

The large mammal species present in the region of the investment location are primarily associated with forest and shrub environment. Their presence on agricultural areas is of short-term nature. Impact of wind farms (operating at the areas of agricultural use) on these animals shall not differ significantly from the functioning of the other infrastructural and utility facilities.
According to the experiences of wind farms operating in the Western Europe, the wind farms cause no changes to the "surface" fauna of a given area.
Scientific literature on impact of wind farms on animals provides no information on the impact on animals moving on surface - such impact was determined only for flying animals, primarily birds, that can collide with the power plant structures.

Wind farms pose no obstacles for animals moving on land.
Sound wave impact (in full spectrum, including infra- and ultrasounds), vibrations and movement of rotor on terrestrial and aquatic vertebrates and on invertebrates is possible however was not studied (Goc, Meissner, 2007).
Infrasound noise levels measured near the wind power plants are very low, undetected by human and cause no proven negative effects for humans. Thus, it can be stated that these are also unharmful for the animals.
Polish legislation does not govern the issue of noise and infrasound impact on animals. The Ordinance of the Minister of Environment of 14 June 2007 on the permissible noise levels in the environment (Journal of Laws of 2007, No. 120, item 826) in force, contains the standards of permissible noise for humans only.
Any potential mortality of birds can change distribution of scavengers, for which the areas of wind farm can become a potential feeding ground.

7.2.8. Impact on acoustic conditions

The performed acoustic analysis for the baseline scenario of the investment (see chapter 6.2.) demonstrated that from the perspective of protection of acoustic conditions, the planned "Bięcino" wind farm can operate in day and night with full sound power of 105 dB.

7.2.9. Impact of wind farms in the scope of infrasound emission

According to Polish Standard PN-86/N-01338 the infrasounds are sounds or noise, frequency range of which is between 2 Hz and 16 Hz. According to ISO 7196 the infrasounds are sounds or noise, frequency range of which is between 1 Hz and 20 Hz.
With regard to infrasounds of artificial origin, the term of infrasound noise and low frequency noise is in use and covers the frequency range from approx. 10 Hz to 250 Hz.
Infrasounds included in infrasound noise are received by the body with specific sound reception route (primarily via hearing organ). Hearing capacity depends on the sound pressure level. High individual variability in hearing perception of ultrasounds was stated, in particular for the lowest frequencies. Infrasound reception thresholds are the higher the lower is their frequency and amount to, for example: for frequencies of 2 Hz approx. 120-140 dB, for frequencies of 6 - 8 Hz approx. 100 dB, and for frequencies of 12 ÷ 16 Hz approx. 90 dB.
Apart from specific sound reception route, infrasounds are received by vibration receptors. The perception thresholds are by 20 ÷ 30 dB higher comparing to the hearing thresholds. When the sound pressure level exceeds 140 dB, infrasounds can cause permanent and adverse changes to the body. The phenomenon of structure and internal organ resonance can occur, percepted already from 100 dB as an unpleasant feeling of internal vibrating. Apart from pressure in ears, it is one of the most common symptoms stated by the persons exposed to infrasounds. However a prevailing effect of infrasound impact on the body is their nuisance, occurring already when the hearing threshold is exceeded at minor level. This phenomenon is specified with subjectively determined excessive tiredness, discomfort, sleepiness, disturbances of balance, psychomotor capacity and physiological functions. Objective confirmation of these conditions are lesions to central nervous systems, specific for activity disorders (according to information published on the official website of the Central Institute for Labour Protection - www.ciop.pl.).
In the case of wind farms, infrasounds are generated in the case of improper profile of turbine blade and poorly selected rotary speed. In the initial stage of development of wind turbines, these were actually onerous to the environment. Legal restrictions and rapid development in this area led however to obtaining the structures that hardly emit

infrasounds.
The structure of nowadays wind power plants minimises production of vibrations related to operation of the power plant. The essential methods of attenuation of vibrations of the wind power plant structures include:

- construction of rotor blades (their aerodynamic profile);
- application of electronic protection measures (change of blade wedge angle and reducing rotor speed prior to entering into the speed range, in which blade vibrations occur);
- gear structure (including application of flexible clutch);
- adequate foundation of the power plant tower with insulation against vibrations.

Due to applied solutions and to the distance of the residential housing from the planned location of the wind power plants (above 500 m), no risk of vibration to the buildings and humans living therein is projected.
According to the conclusions of the scientific expert panel of the (*American Wind Energy Association*, AWEA and *Canadian Wind Energy Association*, CanWEA) (2009) analysing the impact of wind turbines on human health ...) *vibrations transferred by ground and originating from wind turbines are too week to be percepted by or affect humansi*.
On the basis of numerous studies (Ingielewicz, Zagubień 2004, Leventhall 2005, Rogers 2005 and Chouard 2006) it can be stated that:

- infrasound noise levels measured in direct vicinity of the wind power plants are very low;
- sound G level of infrasounds generated by wind turbines measured in a distance of 500 m is practically at the background noise level and imperceptible by humans. For example, according to the measurement results (Ingielewicz, Zagubień 2004) for the Jankowice Wielkie WF, the level of sound G of infrasounds generated by turbines along with noise background fell within the range of 56.4 dB for 2 Hz to 78.4 dB for 16Hz, whereas the level of G sound of background noise after shut-down of all turbines was between 55.8 for 2 Hz and 76.1 dB for 16 Hz;
- infrasounds of G, LG sound level below 90 dB cause no proven adverse effects for human body;
- infrasounds of sound pressure level below the hearing threshold specified above cause no hearing sensation and are not perceptible to humans.

To summarise, wind power plants emit infrasounds at very low level, definitely below the values that can affect human health.

7.2.10. Impact of wind farms and associated infrastructure in the scope of electromagnetic radiation emission

Legal standards regulating environmental impact of electromagnetic radiation
The list of physical quantities recommended for use when assessing the impact of electric fields on humans is provided in the Council Recommendation of 12 July 1999. This recommendation specifies among others restrictions for human exposure in electric, magnetic and electromagnetic fields variable in time. The basis to establish these restrictions were numerous studies on impact of fields on living organisms. The essential quantities for which the basic restrictions were described include:

- magnetic flux density - B;
- current density - J;
- specific energy absorption rate - SAR;
- power density - S.

All quantities depend on frequency of emitted fields.
To enable practical assessment of the risk of exceeding the basic restrictions, so called "reference levels" were used derived directly from basic restrictions. The

reference levels were derived on the basis of analytical scientific methods as well as numerous sensory studies.
The reference levels include:

- electric field strength - E;
- magnetic field strength - H;
- magnetic flux density - B;
- power density - S;
- limb current - IL.

The Council Recommendation, for field frequency of 50 Hz, provides for the following reference level values:

- electric field strength level - **5kV/m**;
- magnetic field strength level - **80 A/m**;
- magnetic flux density - **100μT**.

In the case of no exceeding of the reference levels is stated, no exceeding of basic restriction is also stated. When the values of electric, magnetic field strength or flux density measured in the environment exceed the reference levels, it does not have to mean exceeding of basic restrictions. In such case, following the Recommendation, one should check for each case, whether the basic restrictions are exceeded whether not.
In Poland, the issue of permissible electromagnetic field levels in the environment and methods of controlling their compliance is regulated by the "Environmental Protection Law" Act (uniform text in Journal of Laws of 2008 No. 25, item 150 as amended). Pursuant to Article 3, clause 18 of this Act, electromagnetic field are electric, magnetic and electromagnetic fields of frequencies between 0 Hz and 300 GHz. The issue of protection of the environment against electromagnetic fields is governed by Articles 121-124 of this Act. Permissible levels of electromagnetic fields in the environment and the methods of controlling their compliance are specified by the Ordinance of the Minister of Environment of 30.10.2003 on the permissible levels of electromagnetic fields in the environment and the methods of controlling their compliance (Journal of Laws No. 192, item 1883). This Ordinance specifies the permissible value of electromagnetic fields, in effect of which it is considered that only its exceeding can have an adverse impact on the environment, including human health.
Pursuant to Article 121 of this Act, protection against the electromagnetic fields consists in ensuring possibly the best environmental condition by maintaining the electromagnetic field levels below the permissible or at least at the permissible levels and decreasing the levels of electromagnetic fields to at least permissible levels when these are exceeded.
Permissible levels of electromagnetic fields in the environment are specified separately for the residential housing areas and public areas. Public areas are any sites, excluding these, to which public access is prohibited or impossible without the use of technical equipment.
The Ordinance of the Minister of Environment of 30 October 2003 on the permissible levels of electromagnetic fields in the environment and the methods of controlling their compliance (Journal of Laws No. 192, item 1883) provides for the following limit values:

- permissible value of electric field of 50 Hz for public areas -10 kV/m;
- permissible value of electric field for residential housing areas - 1 kV/m;
- permissible value of electric field of 50 Hz in the environment - 60 A/m.

These values are provided for the height of 2 m above the ground level or above any other surfaces on which people can be present.
Limit values specifies in the Ordinance of the Minister of Environment of 30 October 2003 on the permissible levels of electromagnetic fields in the environment

and the methods of controlling their compliance (Journal of Laws No. 192, item 1883) are presented in the tables below (table 17 and 18):

Table 17 Permissible levels of electromagnetic non-ionising radiation specified by the limit values of physical quantities for public areas.

No.	Radiation frequency range	Electric component	Magnetic component	Power density
1	0 Hz	10 [kV/m]	2500 [A/m]	-
2	from 0 Hz to 0.5 Hz	-	2500 [A/m]	-
3	from 0.5 Hz to 50 Hz	10 [kV/m]	60 [A/m]	
4	from 0.05 kHz to 1 kHz	-	3/f [A/m]	-
5	from 0.001 MHz to 3 MHz	20 [V/m]	3 [A/m]	-
6	from 3 MHz to 300 MHz	7 [V/m]	-	-
7	from 300 MHz to 3 GHz	7 [V/m]	-	0.1 [W/m^2]

Source: Ordinance of the Minister of Environment of 30 October 2003 on the permissible levels of electromagnetic fields in the environment and the methods of controlling their compliance (Journal of Laws No. 192, item 1883)

Table 18 Permissible levels of electromagnetic non-ionising radiation specified by the limit values of physical quantities for residential housing areas.

No.	Radiation frequency range	Electric component	Magnetic component	Power density
1	50 Hz	1 [kV/m]	60 [A/m]	-

Source: Ordinance of the Minister of Environment of 30 October 2003 on the permissible levels of electromagnetic fields in the environment and the methods of controlling their compliance (Journal of Laws No. 192, item 1883)

The legislator imposed on the entities managing the installations and the users of devices emitting electromagnetic fields (being the power stations or overground power lines of nominal voltage of at least 110 kV or radio communications, navigation or location installations emitting electromagnetic fields, equivalent isotropically radiated power of which is at least 15 W, emitting electromagnetic fields of frequencies between 30 kHz and 300 GHz) an obligation to perform measurements the levels of electromagnetic fields in the environment, regardless of the fact whether it was specified in the environmental use permit. These measurements are made directly upon commencement of installation or device use and each time upon change of operating conditions, provided that these chances can influence modification of electromagnetic field levels, source of which is such installation or device.

With regard to the above, the planned "Bięcino" MRP station MV/110 kV will require performance of post-implementation measurements of electromagnetic field levels.

Sources of electromagnetic radiation of the planned investment

The planned investment is composed of the following potential sources of electromagnetic radiation:

- MV/110 kV "Bięcino" MRP transformer station,
- wind power plants;
- MV cable lines, connecting the wind farm with the planned MV/110 kV transformer station;

MV cable connections (connecting the wind farm with transformer station) and the wind power plants (generators) constitute no significant sources of electromagnetic radiation. The technology of construction of such power devices assumes application of adequate screens preventing release of electromagnetic energy to the environment. Medium voltage lines are the linear source of electromagnetic radiation of 50 Hz frequency. Presence of electromagnetic fields around the cables forming the transmission line of HV power is a natural physical phenomenon. In the area of the

cable, in which the current is present, an electromagnetic field is generated determined in physical values (electric component in kV/m and magnetic component in A/m). The cause of generation of electric field is voltage existing between the individual connections and soil, whereas the cause of generation of magnetic field is current in the cable.
The sites of the said electromagnetic fields will be closely associated with placing the source of their emission in space (underground cable) and their physical parameters - of importance from the environmental protection perspective.
Cabled (underground) medium voltage line (MV) constitutes no normative source of electromagnetic radiation. As the line not covered by the provisions of common law in this respect, due to lack of legal substance in the given issue, the line is not subject to radiation assessment in the scope of its impact on human health.
The subject literature provides no information on impact of underground power line on soil organisms.
In the case of absence of normative phenomena, there is no grounds, under the common law, to state negative impact (on human health and natural environment) of electromagnetic fields emitted by the analysed facility - MV cable line.
With regard to the above, a significant source of electromagnetic radiation at the area of the "Bięcino" wind farm can be only the MV/110 kV transformer station ("Bięcino" MRP).

Distribution of electromagnetic field

According to tables 17 and 18, for the areas intended for residential housing the level of electric component of electromagnetic field of industrial frequency (50 Hz - frequency of power grids) cannot exceed **1 kV/m**. For the public areas, permissible level of electric component of electromagnetic field of 50 Hz frequency cannot exceed **10 kV/m**.
Pursuant to the Ordinance of the Minister of Environment of 30 October 2003, 10 kV/m is the limit value of electric field for public areas. For the residential housing areas this value cannot exceed 1 kV/m. These values cannot be present at the height below 2 m above the ground level or above any other surfaces on which people can be present.
The Ordinance of the Minister of Labour and Social Policy of 29 November 2002 on the highest permissible concentrations and rates of factors of adverse effect to health in the working environment (Journal of Laws No. 217, item 1833), four special protection zones are specified for the electric field E of 50 Hz frequency:

- *danger zone, in which E > 20 kV/m;*
- *risk zone, in which 10 kV/m < E < 20 kV/m;*
- *transitional zone, in which 5 kV/m < E < 10 kV/m;*
- *secure zone, in which E < 5 kV/m.*

In the secure zone, the employees can stay without any time limits.
In the transitional zone only the employees working with sources during the whole time shift are allowed.
In the risk zone, time of stay of the employees working with field sources during the shift depends on the value of electric field strength present in this zone.
Stay of employees in the danger zone is prohibited.
At the area in which electric field strength is below 1 kV/m, there are no restrictions and this area is considered perfectly safe for people.
The area, in which the technical equipment of transformer station (emission sources) will be located, will be fenced with a net of approx. 2 m height (or in any other manner specified in separate provisions in this scope) in a manner effectively preventing access of any third persons. The described area will be accessible only to the areas after specialist professional training or potentially persons accompanying them.

The core of environmental impact assessment of the investment for the construction of MV/110 kV transformer station is determination of theoretical distribution of power density of electromagnetic radiation in the areas of potential stay of people. With regard to Article 135 of the Act of 27 April 2001 - Environmental Protection Law, determination of distribution of electromagnetic field in the areas inaccessible to people is not grounded, which is proved by clause 34 of the Ordinance of the Minister of Environment of 30 October 2003 on the permissible levels of electromagnetic fields in the environment and the methods of controlling their compliance, governing their measurement outside the fenced area of the station.
Due to the fact that the area of transformer station will be closed, any potential generation of electromagnetic fields - their areas will remain inaccessible to people. The nearest residential housing development is situated in a distance of approx. 850 m from the planned location of the "Bięcino" MRP.
The aim of analysis of electromagnetic radiation is to estimate the values of such possible impacts and - on the basis thereof - determination of the need to delineate the areas of limited use. According to the applicable environmental law provisions (Article 135 of the "Environmental Protection Law" Act), the areas of limited use are not delineated on fenced areas at which the installations are located. Thus determination - estimation of the areas of electromagnetic fields on the inaccessible area is not grounded from the perspective of standards resulting from individual provisions of the Environmental Protection Law.
On the basis of general land development concept of the transformer station area and experiences in the scope of issues related to projecting the distribution of electromagnetic fields it is stated that location of the components of the said facility excludes the possibility of exceeding of both electric and magnetic component values in the places accessible to people i.e. outside the fencing of the station. At the same time, basing on the experience in constructing such facilities it is stated that electric field strength outside the fencing of the station shall not exceed 1 kV.
The discussed MV/110 KV transformer station ("Bięcino" MRP) will pose no risk to the environment and people and will meet the requirements included in the Ordinance of the Minister of Environment of 30 October 2003 on the permissible levels of electromagnetic fields in the environment and the methods of controlling their compliance.
Also on the basis of current experiences i.e. empirical measurements of electromagnetic fields on similar, existing facilities (110 kV switchboard areas) it is state, that in the area of the planned station, upon its development, in the places accessible to personnel, electric field strength will not exceed the limit value of transitional zone (10 kV/m).
Distribution of magnetic field
According to tables 19 and 20, for the areas intended for residential housing and public areas the level of electric component of magnetic field of frequency (50 Hz) cannot exceed **60 A/m**.
Similarly as in the case of electric field, the magnetic field is governed by the Ordinance of the Minister of Environment of 30 October 2003 on the permissible levels of electromagnetic fields in the environment and the methods of controlling their compliance. This provision provides the limit value of magnetic field for public areas of 60 A/m. These values are provided for the height of 2 m above the ground level or above any other surfaces on which people can be present.
With regard to the area of the planned transformer station being also the working environment, the Ordinance of the Minister of Labour and Social Policy of 29 November 2002 on the highest permissible concentrations and rates of factors having adverse effect to health in working environment. This provision specifies four impact

zones of magnetic fields and provides the limit values for them.
The Ordinance of the Minister of Labour and Social Policy of 29 November 2002 concerning the working environment, specifies four protection zones of 50 Hz frequency for magnetic field H:

- danger zone, in which EH> 2000 A/m;
- risk zone, in which 200 A/m < H < 2000 A/m;
- transitional zone, in which 66.6 A/m < H < 200 A/m;
- secure zone, in which H < 66.6 A/m.

Basing on the experiences in the construction of such type of facilities followed by actual measurements of electromagnetic fields it is stated that the area of the station, upon its development, will generate magnetic field of the strength at maximum load of a values not exceeding 60 A/m (limit value for secure zone). In such case it should be also stated that magnetic field strength outside the fenced area of the station shall not exceed the permissible value for the public areas. As already mentioned, this area will be completely inaccessible to third persons, therefore impact of magnetic components of electromagnetic fields generated at its area, shall have no impact on humans and animals moving on land. This phenomenon can potentially apply to flying single birds, however staying in a given area for a limited period of time. Therefore, this phenomenon should be considered negligible.

7.2.11.Impact on landscape

General landscape conditions of the assessment of the "Bięcino" wind farm

- estimated height of the individual wind power plants (maximum height of the whole structure with rotor in its top position up to 170 m +/- 5% above ground level);
- structure of facilities in the form of solid load-bearing pillar;
- light, uniform colour palette of the whole power plant structure (red blade tops - obstacle marking)
- planned grouping of power plants in a single complex of 13 objects;
- location of the wind farm within the top parts of the moraine upland;
- presence of forest complexes (primarily towards north from the power plant) limiting the views;
- presence of development of the Bięcino, Karżniczka, Budy and Dębniczka villages in the nearest surroundings and of Damnica commune village in a distance of approx. 1.9 km;
- course of local roads near the location of the investment and - in a greater distance - course of national road No. 6 Gdansk - Szczecin in a minimum distance of approx. 4.5 km towards south from the planned wind power plants;
- course in a distance of approx. 300 m towards south of the railway line No. 202 Gdansk - Stargard Szczeciński;
- absence of areas protected due to landscape values in direct vicinity - the nearest landscape park in a distance of approx. 14.2 km and the protected landscape areas - of 14.8 km from the nearest planned location of the wind power plant (see chapter 4).

Detailed analysis of landscape conditions

The planned complex up to 13 wind power plants - as large technical facilities, will significantly and temporarily change (for the period of exploitation of the wind farm - 25-30 years) the landscape and cause its further anthropization within and in the vicinity of its location.
Land mapping (see photos 1 - 4) and analysis of topographic maps in 1:50 000 and 1:10 000 scale (cartographic appendix) demonstrated that the impact of wind farm on landscape will take place primarily:

1) from the arable lands - in direct vicinity of the location of wind farm,
2) from rural settlements located in the surroundings of the location of the investment, in particular from the nearby villages i.e.: Bięcino, Karżniczka, Budy and Dębniczka, in lesser degree from the villages in a greater distance from the location i.e. Rogowica, Grąsino and Damnica commune village;
3) from the roads crossing the location of the investment and in its vicinity, including national road and local roads;
4) from the railway line No. 202 Gdynia - Szczecin;
5) from the nature conservation forms, primarily from the area of Community importance Dolina Łupawy (Łupawa River Valley) „PLH220036", in addition, the power plants will be hardly visible or not visible from the landscape conservation forms aiming at landscape protection.

Ad. 1)

The planned wind power plants, as large technical facilities up to 13 items, will significantly and temporarily change the previous, typical agricultural landscape and cause its further anthropization.

At the location of the investment, where the distances from the planned wind power plants are the smallest and in effect their landscape exposure will be the greatest, no structural objects are present and people are present only periodically during the agricultural works. Due to the above, impact of planned wind power plants on the observers will be limited.

Photo 1 View on the "Bięcino" wind farm from the southern borders of the Bięcino village (from a distance of approx. 600 m).

Photo 2 View on the "Bięcino" wind farm from the road near Karżniczka village (from a distance of approx. 1.4 km).

Photo 3 View on the "Bięcino" wind farm from the western borders of the Damnica village (from the distance of approx. 2 km)

Photo 4 View on the "Bięcino" wind farm from the western borders of the Rogownica village (from the distance of approx. 2 km).

Ad. 2)
Wind power plants visible from the villages located in the surroundings of the location of the investment i.w. in particular from the dense rural development areas of:

- Bięcino - visibility towards south from the distance from approx. 0.5 km;
- Karżniczka - visibility towards north from the distance from approx. 1.6 km;
- Budy - visibility towards west from the distance from approx. 0.8 km;
- Dębniczka - visibility towards west from the distance from approx. 0.6 km;

Wind power plants will be partially covered by tree lanes near the roads, forest complexes and tree stands.
The power plants will be also partially visible from the villages located in a greater distance (more covered by tree lanes, shrubs and development), including from the villages of:

- Rogowica - visibility towards east from the distance from more than 2 km;
- Grąsino - visibility towards north-east from the distance from approx. 3 km;
- Damnica - visibility towards south from the distance from a distance of approx. 1.7 km;

Ad. 3)
Impact of the planned "Bięcino" wind farm on landscape perceived from the transport routes will take place primarily:

- from the local roads crossing the location of the investment and in its surroundings - visibility from a distance from several dozen meters
- from national road No. 6 Gdansk - Szczecin heading towards south from the location of the investment - visibility towards north from approx. 4.5 km to approx. 6 km;

Wind power plants will be partially covered by tree lanes near the roads, forest complexes and tree stands near the national road no. 6.
Ad. 4)
Visibility from the railway line No. 202 Gdynia - Szczecin will take place towards north (from a distance from approx. 300 m to several kilometres). Visibility from greater distances (above 1 km) will be limited due to location of the railway line at large sections in the excavations and presence of tree stands and rural settlement.
Ad. 5)
Visibility of the planned wind power plants from the nature conservation forms will take place primarily from the edges of the site of Community importance "Dolina Łupawy" (Łupawa River Valley) PLH220036 situated approx. 3 km towards east from the location of the "Bięcino" wind farm;
The nearest landscape park „Doliny Słupi" (Słupia River Valley) is situated in a distance of approx. 14.8 km. The power plants will be not visible from the Park, excluding the north-western part of the "Dolina Słupi" landscape part (from the Krępa village).
The nearest protected landscape areas - Coastline towards East from Ustka - is located in a distance of 14.2 km towards north-east from the planned location of wind farm. Due to forest complexes in the vicinity of the "Bięcino" wind farm, wind power plants will not be visible from this area.
Conclusion
According to landscape analysis, the planned complex of 13 wind power plants "Bięcino" in the Damnica commune will be a new specific element of landscape anthropization:

- its landscape exposure will take place primarily from the nearby villages i.e. Bięcino, Karżniczka, Budy and Dębniczka, in lesser degree from more distant villages i.e. Rogowica, Grąsino and Damnica commune villages, from the transport areas crossing the surroundings of the location investment, including for the most

local roads and railway line No. 202 on the Gdansk- Stargard Szczeciński route and in lesser degree from national road No. 6;

- visibility of wind power plants from the landscape conservation forms in the surroundings will take place primarily from the edges of the site of Community importance "Dolina Łupawy" PLH220036 (Dolina Łupawy River) the landscape is not protected under the Natura 2000 sites. Due to the distance and location surrounded by forest complexes, the power plants will be hardly visible or not visible from the remaining areas covered with nature conservation forms (including from the landscape park, protected landscape areas) situated in a greater distance;
- location of the wind farm planned for exploitation for 25-30 years (periodic landscape impact within the agricultural areas, shall contribute to protection of landscape against introduction of permanent settlement type devaluating the investments);
- decommissioning of wind farm shall cause restoration of landscape to the initial state (provided that the agricultural use will be continued).

"Bięcino" MRP power station

The "Bięcino" MRP power station will be located in a distance of approx. 850 m from the nearest residential housing development of the Kolonia Bięcino situated towards west from the investment area. Due to its relatively low size (comparing to the wind power plants) and due to distance, its visibility will be limited and will include several individual buildings.

In addition, the transformer station will be seen by the persons travelling on the local road Grąsino - Bięcino from a minimum distance of approx. 415 m.

7.2.12.Impact on nature protection forms

The areas of the "Bięcino" wind farm and associated infrastructure, including MV cable line and optical fibre, is located outside the spatial forms of nature conservation.

In the regional surroundings of the location of the "Bięcino" wind farm and associated infrastructure, as already stated in chapter 4 (fig. 13), the following form of protection are localised:

- **Słowiński National Park - in a minimum distance of approx. 12.5 km towards north-east, from** the nearest planned location of the wind power plant (approx. 7.5 km to the Park buffer zone);
- **nature reserve**, including:
  - **"Jałowce"** - in a minimum distance of approx. 12.5 km towards north-east from the nearest planned location of the wind power plant;
  - **"Bagna Izbickie"** - in a minimum distance of approx. 17 km towards north-east from the nearest planned location of the wind power plant;
  - **"Torfowisko Pobłockie"** - in a minimum distance of approx. 18.7 km towards north-east from the nearest planned location of the wind power plant;
- **"Dolina Słupi" (Słupia Valley) Landscape Park** - in a minimum distance of approx. 14.8 km towards south from the nearest planned location of wind power plant (approx. 6 km to the Park buffer zone);
- **protected landscape areas:**
  - **Pas Pobrzeża na Wschód od Ustki (Coastline towards East from Ustka)** - in a minimum distance of approx. 14.2 km towards north east from the nearest planned location of wind power plant;
- **Natura 2000 sites**, including:
  - special protection areas
    - **Pobrzeże Słowińskie" (Słowińskie Coastal Region) PLB220003** - in a minimum distance of approx. 12.5 km towards north from the nearest planned location of wind power plant;

- **"Dolina Słupi" (Słupia River) PLB220002** - in a minimum distance of approx. 15 km towards south from the nearest planned location of wind power plant;
- **"Przybrzeżne Wody Bałtyku" (Coastal Baltic Sea Waters) PLB990002** - in a minimum distance of approx. 18.5 km towards north from the nearest planned location of wind power plant;
- **Sites of Community Importance:**
- **"Dolina Łupawy" (Łupawa Valley) PLH220036** - in a minimum distance of approx. 3 km towards east from the nearest planned location of wind power plant;
- **"Ostoja Słowińska" (Słowińska Important Bird Area) PLH220023** - in a minimum distance of approx. 12.5 km towards north from the nearest planned location of wind power plant;
- **„Klify Poddębskie" (Poddębskie Cliffs) PLH220100**- in a minimum distance of approx. 18 km towards north east from the nearest planned location of the wind power plant
- **"Bagna Izbickie" PLH22001** - in a minimum distance of approx. 18 km towards north west from the nearest planned location of wind power plant
- **"Torfowisko Pobłockie" PLH220042** - in a minimum distance of approx. 18.7 km towards west from the nearest planned location of wind power plant.
- **nature monuments** - the nearest ones, within the geodetic precinct of Karżniczka, in a minimum distance of 1.6 km towards south from the nearest planned location of the wind power plant.
- **ecological sites** - the nearest ones, in the area of Dąbrówka Lake, in a minimum distance of 9 km towards east from the nearest planned location of the wind power plant.

Słowiński National Park

Due to the distance (approx. 12.5 km and approx. 7.5 km from the buffer zone) and forest complexes surrounding the Słowiński National Park, the planned "Bięcino" wind farm will not be visible from the Park. In addition, due to the distance and nature of the power plant nature, no impacts on habitats and flora and fauna species protected within the Słowiński National Park will take place.

The wind farm will be also located outside the Park buffer zone (in a distance of more than 7.5 km from its border) established for its protection against the external risks.

Nature reserves

Due to minimum distance of 12.5 km, the subject-matter of protection in the nature reserve (juniper complexes) and location of the reserve within the forest complexes (no exposure of the power plants), implementation of the planned "Bięcino" wind farm and MV cable line with optic fibre shall cause no negative impact on the natural values of the nearest nature reserve "Jałowce".

In addition, the impact of the planned investment on the nature reserves existing in a greater distance from the location of the investment i.e. **„Bagna Izbickie"** and **„Torfowisko Pobłockie"** due to forest type of the nature reserves and distance (17 km and more from the nearest wind power plant) will not occur.

Dolina Słupi (Słupia Valley) Landscape Park and its buffer zone

Exploitation of the investment shall pose no risk of devaluation of the protected values of the "Dolina Słupi" Landscape Park (in a minimum distance of approx. 14.8 km from the nearest power plant towards south. Due to the distance and presence of natural obstacles (tree stands, forest complexes, rural settlement and inclines), wind power plants and associated infrastructure will not be visible from the Park area. The wind farm will be also located outside the Park buffer zone (in a distance of more than 6 km from its border) established for its protection against the external risks.

Protected landscape areas

Exploitation of the "Bięcino" wind farm will cause no risk for the protected values of the

protected landscape areas and to their functions as ecological corridors.
The planned wind power plants will be located in a minimum distance of approx. 14.2 km from the border of the PLA "Pas Pobrzeża na Wschód od Ustki" (Coastline towards East from Ustka). Due to forest complexes in the vicinity of the "Bięcino" wind farm and topography, the planned wind power plants can be visible from this area. Due to the distance (more than 20 km) and covering by the topography and forest complexes, the wind power plants will not be visible from the remaining protected landscape areas.

Natura 2000 sites

Due to the nature of impact and diversity of the environments, exploitation of the "Bięcino" wind farm will have no impact on habitats and flora and fauna species present on the area of Community importance "Dolina Łupawy" PLH220036 (Łupawa River Valley) - the location of the area is not attractive for the animal species protected within the bird area (these animals are associated with aquatic and forest environments). Location of wind power plants in the surroundings of the area was not listed as a potential threat to the area. However, in order to minimise the impact of transport associated with the implementation of the planned investment (construction materials and elements of the wind farm and output from excavations for foundations of the wind power plants) on the Łupawa River Valley ecosystem, it is recommended to delineate access roads onto the investment area circumventing the river valley (see chapter 10).
In the scope of impact assessment of the "Bięcino" wind farm on the Natura 2000 sites present in the surroundings, the "Report from avifauna monitoring of the "Bięcino" wind farm" (Antczak 2010)- **Appendix 6** contains the following conclusions:
No valuable birds protection area worth protection are present in direct vicinity of the planned investment (Antczak, Mohr 2006). The nearest Natura 2000 bird areas established for valuable bird species include DOLINA SŁUPI (PLB 220002) located 11 km towards south-west, Ostoja Słowińska (PLB 220003) located 13 km towards north from the area borders and Przybrzeżne Wody Bałtyku (PLB 990002) located nearly 20 km towards north. Analysis of data obtained during annual field surveys on the planned Bięcino wind farm enables estimating that the investment will have no impact on avifauna associated with the aforementioned sites included in the Natura 2000 network and disturb no integrity of the existing site network established to protect avifauna. During the surveys, no flying of endangered bird species that might nest on protected areas onto the farm area were recorded as well as no assembles of non-breeding birds that might rest on the area of the aforementioned Natura sites were observed (e.g. cranes, geese or swans).
The remaining protected and valuable for bird areas are located in a distance exceeding 20 km (Górski et al. 1991, Gromadzki et al. 1994, Sidło et al. 2003, Antczak, Mohr 2006). Due to distance, it should be assumed that the investment will have no impact on the existing avifauna. Apart from areas of importance for bird protection - the nearest site to the planned farm is the Dolina Łupawy (PLH 220036) bird area located in approx. 5km towards east. Available information (SF) revealed no presence of endangered birds within the area. The valley, at the section adjoining the area of the planned investment, is narrow and mainly afforested - no breeding sites of particular importance for birds exist there (Górski 1982, Górski, Antczak 1998). This area can act as a nesting site of the selected raptor species, however the location of the investment as such is of marginal importance for these species. Typically forest species - e.g. black woodpecker, despite nesting in direct vicinity of the investment, practically do not fly onto it, which results from their biology.
Exploitation of the "Bięcino" wind farm, including the construction and exploitation of 13 wind power plants and power infrastructure will cause no deterioration of natural

habitat status and flora and fauna status and have no adverse impact on the species, for the protection of which the Natura 2000 sites were established. As already mentioned, this results from the following prerequisites:

a. the nearest special protection area "Pobrzeże Słowińskie" PLB220003 (Słowińskie Coastal Region) is situated in a minimum distance of approx. 12.5 km from the planned location of wind farms - pursuant to the findings of the annual ornithological report (Antczak, 2010 - **Appendix 6**) impact of the planned investment on avifauna related to the protected area can be considered marginal;
b. operation of the wind power plants in a minimum distance of approx. 3 km from the borders of the area of Community importance "Dolina Łupawy" and more than 12 km from the remaining areas of Community importance causes no impact on the protected habitats and fauna and flora species within them;

b) operation of the "Bięcino" wind farm with associated infrastructure will cause no disintegration of any of the Natura 2000 sites (power plants will be located outside the Natura 2000 sites);

implementation and operation of the "Bięcino" wind farm shall have no impact on integrity of the Natura 2000 network - during the ornithological monitoring (Antczak 2010- **Appendix 6**) no significant migration routes of birds between the Natura 2000 sites were identified *(...) Delineation of migration route or specific corridor of autumn bird migration is impossible on the monitored surface. Such phenomena are found primarily along the coastlines, river valleys, passes or straits. In the case of monitored areas, neither flight "bottlenecks", nor well-defined ecological corridors able to compress the flight stream, were observed. Thus it should be assumed that the birds have migrated in so called "wide front".*

To summarise, the planned "Bięcino: wind farm shall cause no significant impact on the Natura 2000 sites.

Nature monuments

Operation of the "Bięcino" wind farm with associated infrastructure shall have no impact on the nature monuments in the surroundings of the investment. The nearest ones are located within the geodetic precinct of Karżniczka, in a minimum distance of 1.6 km towards south from the nearest planned location of the wind power plant (see chapter 4.2.).

Ecological sites

The nearest ecological sites are located approx. 9 km towards east from the investment area and include mainly the sites around the Dąbrówka Lake protecting the bog coniferous forests and minor water reservoirs and wetlands.

Operation of the "Bięcino" wind farm shall cause no negative impact on distant ecological sites

Flora and fauna species protection

Operation of the "Bięcino" wind farm shall cause no risk to the protected flora and fauna species - all locations of the wind power plants are planned on the areas of agricultural use and occupied by agrocenoses.

Impact of wind power plants on the protected bird and bat species of individual nature and posing no threat to species population is possible - which results from the performed ornithological and chiropterological monitoring (Antczak, Kośców 2010 and 2009 - **Appendices 6-7**).

At the exploitation stage, the MV cables connecting the wind power plants with the "Bięcino" MRP and optic fibre shall not impact fauna and flora.

7.2.13.Shadow flicker effect

Introduction

The shadow flicker effect is the optic effect related to shadowing of the surrounding areas by rotating wind turbine rotor blade (frequently mistaken with stroboscopic

effect); this effect occurs primarily in short periods of the day, at morning and afternoon hours, when low position of the sun makes it shine from behind the turbine and when the shadows of rotor blades are elongated. It is especially noticeable in the winter period, when the sunlight angle of incidence is the lowest.
Pursuant to the performed surveys, flickering of frequency above 2.5 Hz can pose a nuisance to humans (in vast majority of people, the body reaction occurs at significantly higher frequencies of 16 - 25 Hz). Maximum frequencies of flickering caused by modern wind turbines, including these planned in the design of the "Bięcino" wind farm do not exceed 1 Hz, i.e. are far below the threshold value of 2.5 Hz and should not be perceived as causing adverse effect (http://www.oddzialywaniawiatrakow.pl/).
One should emphasize also that flickering depends on wind direction (rotor positions itself perpendicularly to wind) - the largest effect occurs when the wind blows from the direction, from which the sunlight comes and disappears, when the wind blows perpendicularly to the sunlight angle of incidence (in such case rotor is positioned perpendicularly to sunlight).

Analysis of the shadow flickering effect of the "Bięcino" wind farm

Methodology

Analysis of shadow flickering effect was performed in the WinPro v. 2.8 with the use of Shadow module.
Turbine data from the exemplary turbine of 2.3 MW - Siemens SWT-113 and tower height of 99.5 m and 113 m wide rotor were adopted for analysis purposes.
Analysis of the shadow flickering effect was performed for the two weather scenarios:

- astronomic scenario (extreme) - estimating no impact of atmospheric conditions on sunlight duration (so called potential sunlight duration). The conditions assumed in this scenario are theoretical only and are for illustrative purposes;
- meteorological scenario (probable) - estimating impact of atmospheric conditions on sunlight duration (so called actual sunlight duration). This is the probable scenario considering partial and total nebulosity that might occur during the day in a given month.

In order to perform analysis for the meteorological scenario, average data from the meteorological station in Gdynia were adopted (data from 1969-1993) located in a distance of approx. 87 km from the investment area.
Analysis of the shadow flickering effect assumes that this effect concerns only day and considers the time period during which, due to wind conditions, the turbine does not rotate (too weak or too strong wind), thus the total time of turbine operation was estimated as 1600 hours/year.
In order to specify the projected length of shadow flickering effect at the developed areas, the WindPro programme was entered with 13 receptors (A-M) located within the rural settlement development (see fig. 17).

Results

The provided analysis of shadow flickering effect provided the results presented in tables 19, 20 and on fig. 17.
Astronomic (extreme) scenario
Table 19 . The results of analysis of shadow flickering effect of the "Bięcino" wind farm - astronomic scenario

Receptor	Village	Time (hours/year)	Number of days with shadow flickering effect (days/year)	Maximum duration of effect throughout the day (h/day)
A	Bięcino	97:46	142	2:19
B	Bięcino	102:38	148	2:25

C	Bięcino	92:37	173	2:07
D	Bięcino	94:21	162	2:09
E	Bięcino	144:18	149	3:36
F	Kolonia Bięcino	57:09	137	1:32
G	Kolonia Bięcino	69:19	135	2:23
H	Kolonia Bięcino	32:19	89	1:29
I	Kolonia Bięcino	20:15	77	0:53
J	Budy	77:17	227	2:05
K	Budy	65:51	177	1:35
B	Budy	27:15	104	0:31
M	Dębniczka	47:40	100	0:20

Source: WindPro v. 2.8 programme (Shadow module)

Meteorological (probable) scenario

Table 20. The results of analysis of shadow flickering effect of the "Bięcino" wind farm - meteorological scenario

Receptor	Village	Time (hours/year)
A	Bięcino	2:19
B	Bięcino	2:25
C	Bięcino	2:07
D	Bięcino	2:09
E	Bięcino	3:36
F	Kolonia Bięcino	1:32
G	Kolonia Bięcino	2:23
H	Kolonia Bięcino	1:29
I	Kolonia Bięcino	0:53
J	Budy	2:05
K	Budy	1:35
B	Budy	0:31
M	Dębniczka	0:20

Source: WindPro v. 2.8 programme (Shadow module)

Complete printout of computations from the WindPro programme is provided in Appendix 9, constituting the integral part of this "Report...".

Conclusion

Thanks to the performed analysis it can be stated that the exposure of persons staying in the area of the location of the "Bięcino" wind farm on shadow flickering effect of wind power plants will be minor - short-term in annual scale.

This results primarily from the atmospheric conditions present in this region (large number of days with cloudy weather, during which the shadow flickering effect is absent) and from the distance of residential housing from the planned wind power plants.

The highest projected durations of shadow flickering effects are recorded at the eastern side of Bięcino village (receptor E - see figure 17) of 3 hour and 36 minutes in annual scale (35 seconds a day in average).

The durations of shadow flickering effect recorded for the remaining receptors are lower and amount from approx. 20 minutes (receptor M) to approx. 2:25 minutes (receptor B) a year.

Project:
Bięcino

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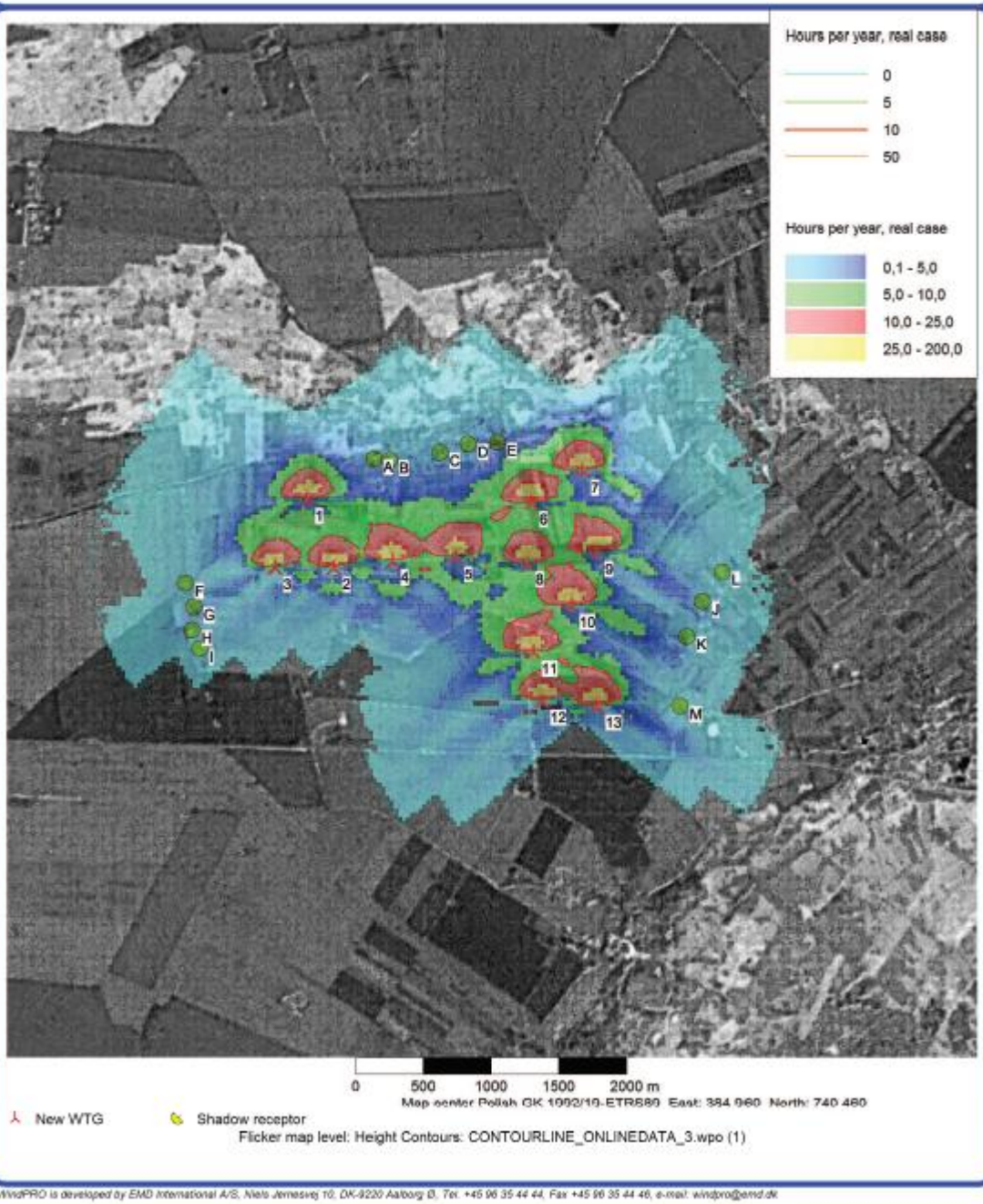
Calculated:
2013-01-17 14:16/2.8.563

SHADOW - Map



Flicker map level: Height Contours: CONTOURLINE_ONLINEDATA_3.wpo (1)

Wind PRO version 2.8.563	Wind PRO version 2.8.563
Oct 2012	Oct 2012
Project:	Project:
Bięcino	Bięcino
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Calculated:	Calculated:
2013-01-17 14:16/2.8.563	2013-01-17 14:16/2.8.563
SHADOW - Map	SHADOW - Map
Hours per year, real case	Hours per year, real case
Hours per year, real case	Hours per year, real case
0,1 - 5,0 5,0 - 10,0	0.1 - 5.0 5.0 - 10.0
10.0-25,0	10.0-25.0
25.0-200,0	25.0-200.0
Map center Polish GK 1992/19-ETRS89 East: 384 960 North: 740 460	Map center Polish GK 1992/19-ETRS89 East: 384 960 North: 740 460
New WTG	New WTG
Shadow receptor	Shadow receptor
Flicker map level: Height Contours: CONTOURLINE_ONLINEDATA_3.wpo (1)	Flicker map level: Height Contours: CONTOURLINE_ONLINEDATA_3.wpo (1)
WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg 0, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mall: windpro@emd.dk	WindPRO is developed by EMD International A/S, Niels Jernesvej 10, DK-9220 Aalborg 0, Tel. +45 96 35 44 44, Fax +45 96 35 44 46, e-mall: windpro@emd.dk

Fig. 17 Analysis of shadow flickering effect of the "Bięcino" wind farm (WindPro v. 2.8 programme - Shadow)

7.2.14.Tangible and cultural assets

At the exploitation stage no impact of the planned "Bięcino" wind farm and associated infrastructure on cultural assets will be present (see chapter 7.1.5.).
Wind power plants will be the new component in the cultural landscape of the location of the investment and its surroundings. Their impact on cultural landscape (agricultural and settlement landscape) will be significant in effect of large and specific technical facilities (see chapter 7.2.8.).
Impact on tangible assets will refer to the scope of land use in the scope of excessive impact of wind farm on acoustic climate. The areas of the power plants and their excessive noise impact (see chapter 7.2.5.), are and will remain in agricultural use. The owners of these area will be unable to change the land use from agricultural to development lands associated with permanent stay of people (settlements, single family houses, etc.). Operation of the power plants shall not affect agricultural activity, with regard to which the lands as arable lands will not lose its value.
The self-government of Damnica commune will obtain indirect economic profits from real-property tax.

7.2.15.Human health

The planned "Bięcino" wind farm and associated infrastructure may potentially impact human health by:

- **noise emission** by the power plants - the "Report..." demonstrates that power plant impact on acoustic climate will meet the standards in force (see chapter 7.2.5.) and won't act as the source of deterioration of human life quality;
- **infrasound emission** - wind power plants emit infrasounds at very low level, definitely below the values that can affect human health. (see chapter 7.2.6.);
- **electromagnetic radiation emission** - power generator of the power plants emit radiation of very low strength, posing no threat to humans and disappearing in a distance of 30-40 m from the source (placed at height of more than 100 m), also the cable (underground) power lines and medium voltage transformer station are not the sources of electromagnetic radiation of excessive values (see chapter 7.2.7.);
- **in the emergencies (construction disaster)** by collapse of the power plant structure - the situation of extraordinary emergency is theoretically excluded, since the structure of power plant meets all standards in the scope of bearing capacity and strength; any possible collapse of the planned wind farms shall pose no threat to the human settlement, which will be located in a distance of at least 500 m;
- **stroboscopic effect** - optic effect caused by periodic light reflections associated with reflecting of sunlight from the rotating blades - negligible impact due to significant distance to the buildings (approx. 500 m). In addition, this effect has been practically eliminated in the modern power plants by applying matt coatings and paints preventing sun reflections (Michałowska-Knap 2006);
- **shadow flickering effect** - as presented in chapter 7.2.13., exposure of persons staying in the location of the wind farm on shadow flickering effect will be minor - short-term in annual scale and apply to single residential areas in the direct vicinity of the planned wind farm.
- **shadowing effect** (shadow cast by power plant structure) - this effect, depending on time of the year and day disappears in the distances exceeding the height of the power plant 2-3 times; due to distance (approx. 500 m and more), the planned power plants can result in short-term shadowing effect within the human settlements only in the winter period, and in the remaining times of the year at low sun positions;

- **effect of changed landscape perception** - periodic impact highly differentiated due to individual and subjective feelings of humans (see chapter 7.2.8.).

Exploitation of the "Bięcino" wind farm shall cause no negative impact on human health. It may however such as any other wind farm affect the quality of life of the local inhabitants, primarily in the emotional and psychical aspects. This may result from no acceptance for change of living environment (for the most landscape change) and subjective fears that the environmental protection standards in the scope of noise, infrasounds and electromagnetic radiation are not kept.

Various aspects of wind farm impact on human health are discussed in the study "Human and environment. Social awareness and acceptance" (Mroczek - edit. 2011), including in particulars in its articles:

- "Facts supporting the wind farm installation project" (Augustyn 2011) - the article contains an analysis of scientific studies on environmental impact of wind turbines, with particular focus on impact of noise level, including infrasounds, on human health. According to the conclusions to the article (Augustyn 2011):

- *The scientific studies confirmed that the noise level, including infrasounds, values of electromagnetic field strength or of the stroboscopic effect occurring during operation of wind farms cause no risk to human health.*
- *Operation of wind farms placed in a distance of several hundred meters from houses and farm buildings is not hearable due to the fact that the sound emitted by rotating blades of the rotor is absorbed by the environment (wind noise in trees and plants, so called "ambient noise).*

- "Myths, beliefs and stereotypes on wind farms in the opinion of adult inhabitants of the localities near wind farms in Poland" (Mroczek 2011) - the article analysis the dominating beliefs of the inhabitants of localities, in the surrounding of which wind farms are planned. According to the conclusions to the article, the belief of adverse impact of wind farms results among other from no access to expert information (based on scientific opinion with respect to the latest technological developments).
- "Impact assessment of wind farms on human health in the opinion of Wolin and surrounding localities inhabitants" (Tarasiuk, Mroczek 2011a) – the article presents the health condition assessment and changes to health conditions of the inhabitants of Wolin and surroundings, households of which are located in direct vicinity of the wind farms. According to the conclusions to the article (Tarasiuk, Mroczek 2011a):

- *The surveyed inhabitants, with the use of SF-36 scale [enabling assessment of 8 quality of life indices], assess their health positively both in physical and psychical aspect. The presence of wind turbines does not affect their assessment of everyday living. (...)*
- *Opinions of the inhabitants on the investment were positive and included the statement that the turbines have no adverse effect on human health.*

- "Critical analysis of the study results presented by Nina Pierpont in the book entitled Wind Turbine Syndrome - A Report on a Natural Experiment' (Tarasiuk, Mroczek 2011 b) - the article contains comparison of the study results presented in the book of Nina Pierpont (this publication acts as one of the crucial arguments of the opponents of wind turbine installation) with the other expert studies in the individual aspect of wind turbine impacts. According to the conclusions to the article (Tarasiuk, Mroczek 2011 b):

- *The results of the studies from methodologically correct studies in the multi-aspect dimension, by the experts in different disciplines, including medical and technical, enable the exclusion of methodologically doubtful results of the Nina Pierpont studies and may at the same time serve as scientifically proven evidence for social consultations.*

7.2.16.Other impacts

Exploitation of the wind farms can have a potential impact on radio and television waves. This phenomenon can result from impact of generator and rotating blades of the rotor and the tower itself (Szuba - edit. 2005).
Interactions related with the impact of electromagnetic radiation of turbine on radio and television waves are preventable by the use of adequate gondola insulation (which is used on standard basis in the modern types of turbines); reflection or refraction of electromagnetic waves by the power plant tower and rotor blades was practically eliminated by the use of synthetic materials for rotor blades and protective coatings.
Any potential disturbances in reception of radio and television waves can be additionally eliminated by (http://www.oddzialywaniawiatrakow.pl/):

- installation of so called directional antenna;
- positioning the antenna towards the other transmitter;
- installation of signal amplifier;
- change of antenna position;
- installation of satellite antenna or cable television.

With regard to shutting down of analogous terrestrial television transmitters and replacing them with digital ones (less susceptible to such disturbances), the potential effect of disturbances of radio and television waves will be completely eliminated.

7.3. Investment decommissioning stage

Projected impacts on the environment of the planned investment composed of

- 13 wind farms of the total power up to approx. 39 MW, placed on reinforced-concrete foundations and equipped with assembly platforms of hardened surface,
- access roads connecting the wind farms with public roads,
- "Bięcino" MRP power station
- cable MV power network with optic fibre cable connecting the wind power plants with the subscriber MRP power station,

is constricted, since it is unknown:

- when decommissioning will take place,
- what technical methods will be used for decommissioning;
- what will be the future condition of the environment.

Decommissioning of the investment with the currently used methods will result in environmental impact comparable with the construction stage, with an obvious difference in a form of large volumes of waste and restoration of landscape to the semi-natural form.
The estimated exploitation period of modern wind farms is 25 - 30 years. It is unknown now whether upon the expiry of this period of time the "Bięcino" wind farm with associated infrastructure will be decommissioned or modernised. Assuming the scenario of decommissioning of the investment, one should focus for the most on the following issues:

1) transformation of land surface,
2) impact on atmospheric air purity,
3) impact on acoustic climate,
4) landscape changes;
5) waste production.

7.3.1. Impact on sub-surface lithospheric layer and soils

<u>Wind power plants</u>

At the wind farm decommissioning stage the following will take place:

- transformations of soil with regard to excavations necessary to liquidate the foundations of the power plants (breaking and transport of produced debris);
- complete decommissioning of the foundations or only of their upper parts (approx. 1-1.5 m below ground level) is possible, to the depth enabling adjustment of land to the new use forms (e.g. restoration for agricultural production or investments);
- filling the post-foundation excavations with the external material;
- reclamation of soil cover and its adjustment to final use, most probably agricultural.

No waste in the form of soil masses will be produced.

The area transformed at the wind farm construction stage (including access roads, manoeuvre yards, etc.) of 6.5 ha will be reclaimed and restored to the initial use (agricultural).

In the emergencies (damage to construction - demolition or transport equipment) local pollution of soil with petroleum products is possible. The methods preventing such situations are discussed in chapter 10.

Operation of heavy construction machinery (demolition equipment) can cause vibrations that will be located in the area of the conducted works and discontinued upon their completion. Due to large distances between the residential housing development and the station area (approx. 850 m) no risk of vibrations for the nearest buildings and humans living therein will be present.

"Bięcino" MRP power station

Like in the case of wind fams, liquidation of the transformer station will cause impact on the top layer if the litosphere, which, qualitatively, would be similar to the impact caused by the liquidation of a wind farm, but on a much smaller area (up to approx. 1 ha).

At the final stage of decommissioning of the stations, their area will be reclaimed by adjustment to final use (agricultural, forest or other).

MV power cables and optic fibres

MV power cables and optic fibres will be decommissioned primarily within the existing road lanes and agricultural lands at the section of approx. 6 km. Apart from power cables, decommissioning will cover also optic fibres running along the power lines.

Transformations of sub-surface lithospheric layer will include:

- soil transformations due to excavations necessary to decommission the line;
- liquidation of soils in the area of excavations, of maximum range as specified above;
- filling the post-foundation excavations with the external material;
- reclamation of soil cover and its adjustment to final use, most probably agricultural, due to the nature of surrounding areas.

At the sections, at which the method of non-excavation cable location in the soil will be used (controlled drilling) - under the hardened roads, their decommissioning will be made with a reverse method - used for non-excavation extraction, without the need of damaging the sub-surface lithospheric layer.

Soil pollution during the failure leakage of petroleum substances from the construction (demolition) and transport equipment may constitute a potential risk to soils. The methods preventing such situations are discussed in chapter 10.

Operation of heavy construction machinery can cause **vibrations**that will be located in the area of the conducted works and discontinued upon their completion.

No risk of vibrations to the nearest buildings and people residing therein is projected (current minimal distance of development from the line is 320 m).

7.3.2. Impact on hydrographic conditions and water quality

Wind power plants, "Bięcino" MRP

No surface water are present at the area of direct locations of the wind power plants and the planned transformer station. decommissioning of the wind farm and associated infrastructure shall have no impact on the hydrographic objects nearby, the nearest of which include drainage ditches (in a distance of approx. 800 m from the nearest wind power plants) and Charstnica River (in a distance of approx. 1.5 m from the nearest wind farms).
With regard to shallow foundations of the power plants (approx. 3 m below ground level), no damage to the first groundwater level will take place.
With regard to decommissioning of the foundations of wind farm and transformer station, previous reduction of storm water infiltration caused by these elements will cease.
In order to minimise the treats related to failure-based leakage of petroleum substances, the works of temporary equipment bases (construction of non-permeable surfaces) should be secured and performance of any potential equipment repairs outside these area should be eliminated (see chapter 10).
Servicing the decommissioning sites in the area of sanitary sewage collection shall be made with the use of mobile toilettes (toi-toi type) serviced by specialised septic companies. The volume of produced household sewage (with consideration to filling of mobile toilettes with the mixture of chemical agents neutralising impurities) will be approx. 200 l/week per each 10 persons employed at the construction site. This sewage will be collected by a septic company servicing mobile toilets and disposed to sewage treatment plant.

MV power cables and optic fibres

With regard to the line route along the road lanes and via agricultural lands in its entirety (in a distance from hydrographic objects), its decommissioning shall have no impact on the nearest hydrographic objects located in the environment.
The investment will be neutral in context of achievement of environmental objectives specified in the "Water management plan within the Vistula River basin" (2011).
Impact of decommissioning of the "Bięcino" wind farm on delivery of the assumptions of the "Water management plan at the area of the Vistula River basin" (2011).
As demonstrated in chapter 3.2.2. of the "Report ...", no surface water are present at the area of direct locations of the wind power plants and the planned transformer station. Decommissioning of the wind farm and associated infrastructure shall have no impact on the hydrographic objects nearby.
Decommissioning of the planned MV power lines and optic fibre in a distance from watercourses shall cause no negative impact on them.
Chapters 7.1.2. and 7.2.2.. of the "Report..." demonstrated that construction and operation of the "Bięcino" wind farm with technical infrastructure, with the use of environment friendly technologies assumed in the project, will not result in threats to surface and groundwaters.
With regard to the above, the planned investment will be neutral in context of achievement of environmental objectives specified in the "Water management plan within the Vistula River basin" (2011).

7.3.3. Impact on climate conditions

Wind power plants and "Bięcino" MRP station

During the decommissioning of the "Bięcino" wind farm, the changes to current local climate conditions will occur, caused by modified nature of active surface between atmosphere and Earth along with progress of the decommissioning of construction structures and facilities.
Changes to local climate conditions will cover mainly thermal conditions (decreased air temperature), humidity (increased air relative humidity) and anemometric conditions (increased or decreased depending on target use - e.g. afforestation may

reduce airing and agricultural use will stimulate it). These changes will be negligible for the surroundings of the station area, neither for biotic environment nor for people.

MV power cables and optic fibres

The the sections of decommissioning of the planned cables within the agricultural lands, decommissioning of the line will have marginal impact on the local climate conditions and that impact will be limited to changes in micro-climate scale. These will include marginal changes associated with the change in the nature of active surface i.e. from covered with vegetation into no-vegetation surface. Change of surface will be of periodic nature i.e. after decommissioning of the cable lines, the excavation area will be reclaimed enabling vegetation growth (natural or associated with crops) and therefore return to normal climatic conditions.

At the sections, at which the power cables will be decommissioned with non-excavation method, no impact on climate conditions will take place.

7.3.4. Atmospheric air

Impact on air pollution will result primarily from operation of the construction machinery (excavations, demolition and waste transport).

Vehicle traffic, excavations and their filling and storage of soil from the output and potentially of bulk construction materials as well as breaking of concrete foundations of the power plants and transformer station will cause periodic emission of particulate matter to air. It will be of fugitive nature, of limited range, primarily to the construction site area. With a view to good airing conditions, it shall have no significant impact on the aerosanitary conditions in the area of the investment implementation.

Qualitative composition of the emitted pollution will be similar as at the power plant construction stage - see chapter 7.1.3.

At present it is unknown what quantitative specification of emission will be attributable to the machinery and vehicles in 25-30 years. Within the last several years, a significant progress in the scope of reducing the emission of toxic compounds from the combustion engines has been observed. Each vehicle model, before authorising on the market, is tested for compliance with current pollution standards. Permissible pollution limits are regularly tightened. Changes to the limits imply introduction of the new technical solutions (e.g. replacing the carburettors with injection systems, introduction of catalytic converters and absorbers with activated carbon, etc.). Reduction of unit emission is currently faster than increase in the number of vehicles, in effect of which, due to replacing the old vehicles with the new ones, significant reduction of emission of toxic compounds to air is observed.

According to the literature [VTI Meddelande 618, "Trafik och avgasutslapp - utblick mot 2015"], in Sweden, the highest emission of transport pollution has been present around 1987 (180 000 tonnes of NOx, 180 000 tonnes of Hc and 1000 000 tonnes of cO). In 2000, despite increased number of vehicles, emission was reduced by nearly 50% for NOx, 70% for HC and 60% for CO. In the following years, further reduction in transport pollution emission is estimated.

7.3.5. Acoustic climate

At the decommissioning stage of the investment, noise accompanying the operation of machines, excavators, cranes, mechanical tools, etc. will be present. Noise will be also generated by heavy transport supplying the elements of power plant and concrete for foundation purposes.

Exemplary noise levels (in a distance of 7 m from the operating device) emitted by construction equipment and machinery - are provided in chapter 7.1.4.

Noise produced at the decommissioning stage will be short-term, local and will be discontinued upon completion of works. Acoustic nuisance depends on the distance from the construction site and operation time of individual equipment. Due to no

detailed schedule of works and the list of equipment operating at the decommissioning stage of the "Bięcino" wind farm at the current stage, no detailed analysis of the investment decommissioning impact on the acoustic climate of the location can be performed.
Decommissioning of the planned MV cable and optic fibre concerns among others the areas in direct vicinity of the residential areas (currently - homestead development).
Apart from the route of MV cable and optic fibre, demolition works will be performed in a distance from the currently residential housing development, i.e.:

- in minimum distance of approx. 500 m from the location of wind power plants;
- in a distance exceeding 850 m from the "Bięcino" MRP transformer station;

All decommissioning works will be performed during the day. It is projected that the equivalent noise level outside the area of performed works, caused by operation of construction machinery and accompanying technical equipment as well as increased traffic of self-propelled vehicles and cars will not exceed the permissible level at the areas under noise protection (**periodic noise level during demolition works is not regulated by the Polish legislation**).
Considering the fact that this nuisance will be periodic and typical for demolition works, it will apply only to the decommissioning of the investment and discontinue along with completion of works, it is stated that the periodic adverse impact on acoustic climate related to demolition works will be acceptable as a temporary phenomenon and cause no threat to the environment and humans and the nearest areas under noise protection.

7.3.6. Electromagnetic radiation

Wind power plants
Within the process of wind farm decommissioning no electromagnetic radiation emission will occur.
"Bięcino" MRP power stations
Within the process of power station decommissioning no electromagnetic radiation emission will occur.
MV power cables and optic fibres
Within the process of cable decommissioning no electromagnetic radiation emission will occur.

7.3.7. Waste production and utilisation

During decommissioning of the "Bięcino" wind farm, waste listed in table 21 will be produced.
Table 21 Types and volumes of waste at the decommissioning stage of the Bięcino wind farm

Waste group code	Waste type	Volume
17	**CONSTRUCTION AND DEMOLITION WASTES (INCLUDING EXCAVATED SOIL FROM CONTAMINATED SITES)**	
17 01	Construction material and element waste and road infrastructure waste (e.g. concrete, bricks, tiles and ceramics)	
17 01 01	Concrete waste and debris from demolition and renovation works	approx. 10 500 m^3
17 01 03	Tiles and ceramics waste	approx. 8.2m^3

17 01 07	Mixtures of concrete, bricks, tiles and ceramics other than those mentioned in 17 01 06	approx. 9.6 m^3
17 01 82	wastes not otherwise specified	approx. 6 m^3
17 02	**Wood, glass and plastic waste**	
17 02 03	Plastics (rotor blades)	approx. 157 t
17 04	**Metals and scrap (including their alloys) waste**	
17 04 05	Iron and steel (one power plant of approx. 410 t)	approx. 5 330 t
17 04 11	Cables other than those mentioned in 17 04 10	approx. 7 000 rm
17 06	**Insulation materials and asbestos-containing construction materials**	
17 06 04	Insulation materials other than those mentioned in 17 06 01 and 17 06 03	approx. 11 m^3

Source: own study on the basis of estimates from demolition of wind farms in the EU member states, waste classification according to the Ordinance of the Minister of Environment of 27 September 2001 on the catalogue of waste

Waste will be collected by authorised entities - responsible for waste management upon disassembly.

The power plant structures will require scrapping (max. 13 power plants x approx. 410 tonnes = 5330 tonnes), similarly to power cables.

The specific type of waste produced in effect of disassembly of wind farms will be plastics (polyester and glass laminates), of which the rotor blades are produced (in quantity of approx. 160 t). Polyester and glass laminate waste can be stored on landfills or subject to one of three recycling methods (Jurczak, Jastrzębska 2010):

- raw material recycling i.e. degradation of macro-particles to fractions of lesser molecular weight e.g. using the hydrolysis method, alcoholysis, hydrogenation or pyrolysis, which can be re-used as monomers or raw materials for the production of the other or the same chemical products;
- energy recycling during combustion,
- material recycling i.e. repeated direct waste processing without any chemical processes with obtaining of the material constituting the full-value raw material for further processing.

At present, polyester and glass laminate waste in Poland are mainly disposed on landfills. However in future (in 25-30 years) the aforementioned recycling technologies can gain popularity.

Decommissioning of the power plant foundations will produce debris that will be disposed on landfill or transferred for use to natural persons (pursuant to the Act on waste currently in force - it is unknown what provisions will be in force in 25-30 years). Volume of concrete debris will be approx. 10 500 m^3

Other waste

Apart from waste listed previously with regard to decommissioning of the "Bięcino" wind farm, the following waste will be produced:

- mineral based non-chlorinated hydraulic oils, code 13 01 10 (**hazardous waste**) in volume of approx. 1.4 m^3.
- mineral-based non-chlorinated engine, gear and lubricating oils, code 13 02 05 (**hazardous waste**) in volume of approx. 8.6 m^3.
- other engine, gear and lubricating oils, code 13 02 08 (**hazardous waste**) in volume of approx. 2.5 m^3;
- discarded equipment containing hazardous components other than those

mentioned in 16 02 09 to 16 02 12, code 16 02 13 (**hazardous waste**);
- used oily wiping cloths and protective clothing, code 15 02 02 (**hazardous waste**),
- non-segregated mixed municipal waste, code 20 03 01, will be stored in designated and secured sites (hazardous waste will be stored in tight containers) until collection (by specialist companies) or transferred to the nearest sites for recycling or utilisation.

Rules for waste handling are regulated by the Act on waste (uniform text in Journal of Laws of 2007 No. 39, item 251 as amended) and implementing legislation thereto.
At the same time, decommissioning of the "Bięcino" wind farm will cause complete discontinuation of noise emission and potential impact on birds and bats.
In effect of replacement of the planned power plants to new ones, an issue of scrapping of the structure of the previous power plants will appear. For now, it cannot be stated whether the foundations will be able for further use.

7.3.8. Impact on vegetation, fungi and natural habitats

Wind power plants
At the decommissioning stage of the foundations of the power plants and access roads, a partial liquidation of previously formed vegetation cover of agrocenoses will take place.
Finally, in effect of reclamation of the area of the decommissioned wind power plants, utility or ornamental vegetation will be introduced. Depending on the direction of reclamation of the wind power plant area, the location can become a valuable natural habitat - e.g. forest habitat.
Similarly as at the construction stage, during the works related to decommissioning of access roads to wind power plants, it will be necessary to secure trees growing in direct vicinity of the performed works by their formworking, provided that these will be present at the investment decommissioning stage.
"Bięcino" MRP power stations
Decommissioning of the "Bięcino" MRP power station will cause impact analogical to the decommissioning of the "Bięcino" wind farm although of lesser strength and spatial range.
MV power cables and optic fibres
With regard to decommissioning of the MV power cables and optic fibre located within the road lanes and on agricultural lands, liquidation of vegetation will take place (currently agrocenoses and segetal vegetation).

7.3.9. Fauna

Wind power plants
The areas of wind farm will be an anthropogenic habitat not attractive to fauna. Demolition works will cause deterring of fauna, primarily birds. Fauna losses can apply to edaphon (soil fauna) and soil mammals (e.g. moles).
Pursuant to the mammal, reptile and amphibian inventory (Haplicznik, Kaszewska-Mejer, Jaśkiewicz and Szmigiel 2012) - **Appendix 4** and insect inventory (Haplicznik, Lasecki and Szmigiel 2012) - **Appendix 5**. In order to protect the animal species that might be potentially present within the area of the "Bięcino" wind farm, the authors of environmental inventories provided a number of recommendations that shall be applied at the construction stage of the investment (see chapter 7.1.8.), analogical activities shall be introduced at the investment decommissioning stage.
In addition, these impacts can be minimised by selection of the adequate technology of demolition works and the period of their performance (see chapter 10).
"Bięcino" MRP power station
Decommissioning of the "Bięcino" MRP power station will cause impact on fauna

analogical to the decommissioning of the "Bięcino" wind farm although of lesser strength and spatial range.

MV power cables and optic fibres

Transformations of habitats within the areas of decommissioned cables will result primarily in liquidation of soil fauna (edaphon).

Impact on fauna during decommissioning of cables will be associated with deterring effect of operation of the construction - demolition and transport - equipment (noise, exhaust fumes, physical risk). The deterring effect will cover all systematic groups of animals. Fauna will migrate periodically on the adjoining areas, excluding the species easily subject to synanthropization and of high adaptation capacity to variable environmental conditions (primarily certain species of birds, rodents and insects). These impacts can be minimised by selection of the adequate technology of demolition works and the period of their performance (see chapter 10).

Upon completion of demolition works and reclamation of areas of demolished pillars, the living conditions of animals will return to the initial state.

7.3.10.Impact on landscape

Wind power plants and "Bięcino" MRP power stations

The impacts associated with decommissioning of wind farm and transformer stations on landscape values will be strongly related to the two stages of decommissioning works, including:

- decommissioning stage of building structures and technical equipment - at this stage, the landscape will be transformed from industrial (infrastructure) one into open area landscape with no investments;
- reclamation and final use of the area - at this stage the area will be reclaimed in the currently unknown direction and used; for agriculture, forests or in any other way.

MV power cables and optic fibre

Decommissioning shall result in landscape impact in similar range as construction i.e. will be limited practically directly to the area of excavations. In addition, the area transformed during cable decommissioning will be reclaimed and adjusted to its initial function.

7.3.11.Impact on nature protection forms

Wind power plants and "Bięcino" MRP power station

- Area and object forms of nature protection

The area of the "Bięcino" wind farm location and of the planned transformer station, is located outside the spatial forms of nature protection.

The nearest spatial form of nature protection is the Natura 2000 site of Community importance **"Dolina Łupawy" PLH220036** (Łupawa River Valley) in a distance of approx. 3 km from the nearest planned locations of wind power plants and the remaining associated infrastructure.

The nearest nature monument - common oak - is located in a distance of 1.6 km towards south from the nearest palnned location of the wind power plant - in the Karżniczka village.

Due to distances and nature of the demolition works, decommissioning of wind power plants will not impact the habitats, plant and fungi species within the Natura 2000 site **"Dolina Łupawy" PLH220036** and the nature monument in the Karżniczka village.

- Protection of habitats and species protection of flora, fauna and fungi

Impact of decommissioning stage of the "Bięcino" wind farm on the protected habitats and fauna, flora and fungi species was described in chapters 7.3.8 and 7.3.9.

MV power cables and optic fibres

- Area and object forms of nature protection

Due to distance of 3 km and nature of the construction works, implementation of SN cable line and optic fibre will not impact the habitats, plant and fungi species within the Natura 2000 site**"Dolina Łupawy" PLH220036** and the **nature monument in a distance of approx 2 km** in the Karżniczka village.

- Protection of habitats and species protection of flora, fauna and fungi

Impact of decommissioning stage of the "Bięcino" wind farm on the protected habitats and fauna, flora and fungi species was described in chapters 7.3.8 and 7.3.9.
Decommissioning of MV cable line will be limited to the areas of agricultural use within agrocenoses. In addition, at the crossings of cable lines under the watercourses, a non-excavation method of cable line extraction will be used (reverse to the controlled drilling method). Use of this method shall cause no negative impact on watercourse vegetation and habitats.

7.3.12.Impact on tangible and cultural assets

Wind power plants
Decommissioning of wind farm will cause loss of tangible asset i.e. the power plants - it may be assumed that decommissioning will take place when the power plants will be redundant.
In the surroundings of the wind farm location, tangible assets have been currently represented by unpaved and hardened roads, settlements (currently in minimum distance of approx. 500 m) and drainage equipment on agricultural areas.
During decommissioning of the station, no impact on so called tangible assets will take place, excluding the use of access roads.
Part of "Bięcino" wind farm is located within the archaeological-conservator protection sites.
Decommissioning of wind farms within their area will require repeated arrangements with the voivodeship conservator of monuments.
"Bięcino" MRP power station
Decommissioning of station will cause loss of tangible asset i.e. the station - it may be assumed that decommissioning will take place when the station will be redundant.
During decommissioning of the station no impact on tangible assets in its surroundings will take place (current settlements, road network, medium and high voltage cable power lines), excluding the use of access road.
Power station, so as the wind power plants, are located within the identified archaeological-conservator protection sites (see cartographic appendix). Decommissioning of the power station will require prior arrangements with the voivodeship conservator of monuments.
MV power cables and optic fibres
Decommissioning of cables will cause loss of tangible asset i.e. the cables - it may be assumed that decommissioning will take place when the line will be redundant.
In the surroundings of the cable route, tangible assets are currently represented by unpaved and hardened roads and settlements - during decommissioning of cables no impact on these tangible assets will take plate, excluding road use.
Decommissioning of cables under the hardened roads will be performed with the use of non-excavation method and cause no negative impact on their technical condition and functionality.
Power cables, so as the wind power plants and power station, are located within the identified archaeological-conservator protection sites (see cartographic appendix). Decommissioning of the power lines within their area will require prior arrangements with the voivodeship conservator of monuments.

7.3.13.Human health

Nuisance related to vehicle transport impact (mostly waste), i.e. air pollution (exhaust

fumes and road dust), noise and risk of accidents will be limited in space (road surroundings) and time.
Due to location of the investment outside the settlements, in large distances from them, these nuisance will be limited. The method of further minimisation of its impact on environment, including on human life conditions, are specified in chapter 10.
Nuisance for humans associated with direct demolition works causing emission of air pollution and noise, will be minor due to the nature of demolitions (primarily disassembly) and large distances from development (see table 4 in chapter 6.2.).

8. INVESTMENT IMPACT ASSESSMENT ON LEGAL FORMS OF NATURE CONSERVATION AND LANDSCAPE PROTECTION - LEGAL ASPECTS

8.1. Location of the "Bięcino" wind farm,

The area of the "Bięcino" wind farm and associated infrastructure, including MV cable line, is located outside the spatial forms of nature conservation.

Species protection of flora, fauna and fungi

Species protection of flora, fauna and fungi is governed by the following legal acts:

- Act of 16 April 2004 on nature conservation (uniform text in Journal of Laws of 2009, No. 151, item 1220 as amended, including the amendments introduced by the Act of 13 July 2012 on amendments to the Act on nature conservation and certain other acts - Journal of Laws of 31.08.2012, item 985);
- Ordinance of the Minister of Environment of 12 October 2011 on species protection of animals (Journal of Laws No. 237, item 1419).
- Ordinance of the Minister of Environment of 5 January 2012 on species protection of plants (Journal of Laws 2012.01.20, item 81).
- Ordinance of the Minister of Environment of 9 July 2004 on the protected species of wild fungi (Journal of Laws No. 168, item 1764).

At the areas of the planned locations of the wind power plants only the arable land agrocenoses with periodic segetal vegetation are observed, no presence of habitats and plant species covered with species protection was stated (Ordinance of the Minister of Environment of 5 January 2012 on species protection of plants (Journal of Laws of 20 January 2012, item 81).

As assessed in chapters 7.1.7, 7.1.8 and 7.2.6. and 7.2.7, implementation and exploitation of the "Bięcino" wind farm will cause no negative impact on the protected species of flora, fauna and fungi covered with species protection.

As demonstrated in the ornithological monitoring by Antczak (2010) - Appendix 6 and chiropterological monitoring by Kościow (2010) - Appendix 7, implementation and exploitation of wind farm shall cause no negative impact on the protected bird and bat species (see chapter 7.1.8. and 7.2.7.).

Protection of green areas and tree stands

Location of wind power plants and the routes of access roads and MV cable lines were delineated with maximum circumvention of forest complexes, tree stands and shrubs (see cartographic appendix).

Removal of trees and shrubs with regard to development of associated association (access road and cable line) is not planned. Such situations, if any, will be occasional in context of the aim of the investor to minimise the environmental impact and adjustment of the course of investment elements to the recommendations resulting from vegetation inventory.

The conditions of trees and shrubs protection are specified in the Act on nature conservation (uniform text in Journal of Laws of 2009, No. 151, item 1220 as amended):

Article 83.

1. Trees or shrubs may be removed from the area of real-property subject to paragraph 2 and 2a, upon obtaining of the permit issued by head of commune, mayor or president of the city on request of:

1) holder of real-property upon consent of the owner of this real-property;

2) owner of equipment, referred to in Article 49 § 1 of the Civil Code, provided that threes or shrubs pose a threat to the operation of this equipment.

1a. Consent of the owner of real-property, referred to in paragraph 1, clause 1, is not

required in the case of application filed by the perpetual user of the real-property.

2. Permit for removal of trees or shrubs from the area of real-property entered into the register of monuments is issued by the voivodeship conservator of monuments.

2a. Permit for removal of trees within the public road lane, excluding foreign species of poplar, is issued upon consultation with the regional director of environmental protection.

2b. Failure to provide a statement of reasons within 30 days from the day of receiving the draft permit, referred to in paragraph 2a, by the regional director of environmental protection shall be considered as consultation of the permit.

2c. The authority competent to issue the permit, referred to in paragraph 1, should carry out field inspection in the scope of presence of protected species within tree stands before issuing the permit.

(...)

6. The provisions of paragraphs 1 and 2 shall not apply to trees or shrubs:

1) in the woods;

2) fruit trees or shrubs, excluding these growing within the real-property entered into the register of monuments and within the national park or nature reserve - at the areas not covered with landscape protection;

3) on tree and shrub plantations;

4) below 10 years of age;

5) removed with regard to operation of botanic or zoological gardens;

6) (repealed);

7) removed under the decision of the competent authority from the areas situated between the coastline and flood embankment or naturally high bank, in which the route of flood embankment was embedded, from flood embankments and areas in a distance below 3 m from the embankment foot;

8) which disturb visibility of signalling devices and trains and impede exploitation of railway devices or cause formation of snowdrifts on railway tracks, removed under the decision of the competent authority;

9) being the aviation obstacles, removed under the decision of the competent authority;

10) removed under the decision of the competent authority due to the needs related to maintenance of detailed water drainage equipment.

In the case of stating no opportunity of circumventing non-fruit trees or shrubs aged above 10 years at the stage of technical design of the MV power cables, these will be subject to inventory, on the basis of which the investor will apply to the Head of Damnica commune for permit for their logging or replanting.

With a view to pursuit of the investor to minimise environmental impact, these situations will be incidental, if any.

8.2. Regional surroundings of the "Bięcino" wind farm,

As assessed in chapters 7.1.9., 7.2.10., implementation and operation of the "Bięcino" wind farm in a distance from spatial and object forms of nature conservation, in a distance of several - several dozen kilometres, shall not infringe the provisions in force at their area.

The nearest spatial form of nature conservation is the **Natura 2000 site of Community importance "Dolina Łupawy" PLH220036** (Łupawa River Valley) located in a distance of approx. 3 km towards east.

Legal conditions for **Natura 2000 sites** are laid down in the Act of 16 April 2004 on

nature conservation (uniform text in Journal of Laws of 2009, No. 151, item 1220 as amended). Pursuant to Article 33 of this Act:

(...)

Article 33. 1. It is prohibited, subject to Article 34, to undertake any activities that might, alone or in combination with any other activities, have significant negative impact on the objectives of Natura 2000 site protection, including in particular:

1) deteriorate the condition of natural habitats or habitats of flora and fauna species, for the protection of which the Natura 2000 site was established or

2) have a negative impact on the species, for the protection of which the Natura 2000 site was established or

3) deteriorate the integrity of the Natura 2000 site or its associations with the other areas.

2. The provision of paragraph 1 shall be applied respectively to the proposed areas of community importance included on the list, referred to in Article 27, paragraph 3, clause 1, until the European Commission approves them as the areas of Community importance and establish them as special areas of conservation.

3. Draft policies, strategies, plans and programmes and amendments to such documents as well as any planned initiatives, that may have a significant impact on Natura 2000 site and which are not directly associated with the protection of Natura 2000 site or the areas, referred to in paragraph 2, or do not result from that protection, require the proceeding on the environmental impact assessment under the rules laid down in the Act of 3 October 2008 on sharing information about the environment and its protection, public participation in environmental protection and on the environmental impact assessments.

(...)

Article 34. 1. If the necessary requirements of superior public interests, including social or economic requirements, dictate so, and in the case of no alternative solutions, the locally competent regional director of environmental protection and on maritime areas the director of the competent maritime office, may permit the implementation of plan or activities that might have a negative impact on the objectives of Natura 2000 site or the areas included on the list, referred to in Article 27, paragraph 3, clause 1, ensuring the performance of environmental compensation necessary to guarantee integrity and proper functioning of the Natura 2000 network.

2. When a significant negative impact refers to priority habitats and species, the permit, referred to in paragraph 1, can be granted only for the purposes of:

1) protection of human health and life;

2) ensuring common safety;

3) obtaining advantageous effects of primary importance for natural environment;

4) resulting from the necessary requirements of the superior public interest, upon obtaining the opinion of the European Commission.)

(…)

Article 35a. In the case of activities intended for implementation under the planned investments, the permit, referred to in Article 34, paragraph 1, shall be replaced by decision on environmental conditions or consultations with the regional director of environmental protection, in the meaning of the Act of 3 October 2008 on sharing information about the environment and its protection, public participation in environmental protection and on the environmental impact assessments. (...).

Article 36. 1. On the Natura 2000 sites, subject to paragraph 2, the activity related to maintenance of equipment and facilities ensuring flood safety and business, agricultural, hunting and fishing activity as well as amateur fishing is not prohibited,

provided that it has no negative impact on the objectives of the protection of Natura 2000 sites. (...)
In addition, the Ordinance of the Minister of Environment of 12 January 2011 on special protection areas (uniform text in Journal of Laws of 2011,No. 25, item 133) contains the following provisions:
(...)
§ 4. The objectives of establishing the areas, referred to in § 2, are: protection of wild bird species populations, maintenance and management of their habitats in compliance with the environmental requirements, restoration of damaged biotopes and their formation.
§ 5. The subject-matter of protection includes bird species listed in Appendix No. 2 to the Ordinance, meeting the criteria laid down in the Ordinance of the Minister of Environment of 13 April 2010 on natural habitats and species of Community interest as well as on the selection criteria for the areas eligible for recognition or establishment as Natura 2000 sites (Journal of Laws No. 77, item 510) and their natural habitats.
Supplementary provisions of common law with a view to Natura 2000 site are implemented by the Ordinance of the Minister of Environment of 13 April 2010 on natural habitats and species of Community interest as well as on the selection criteria for the areas eligible for recognition or establishment as Natura 2000 sites (Journal of Laws of 2010 No. 77, item 510) and their natural habitats.
Pursuant to the Act on nature conservation, the site supervisor shall prepare draft plan of protection activities for the period of 10 years for the Natura 2000 site (the draft shall be approved by the Regional Director of Environmental Protection by means of an order) and draft protection plan (draft shall be approved by the minister competent for environmental by means of an ordinance). Such drafts have not been prepared for the nearest Natura 2000 sites in the surroundings for the location of the investment yet.
As presented in details in chapter 7.1.9., 7.2.10. implementation and operation of the "Bięcino" wind farm shall cause no negative impact on the Natura 2000 sites and in particular shall not:

- deterioration of the condition of natural habitats or habitats of flora and fauna species, for the protection of which the Natura 2000 sites were established or
- have a negative impact on the species, for the protection of which the Natura 2000 sites were established or
- deteriorate the integrity of the Natura 2000 sites and its associations with the other areas.

With regard to the above, implementation and operation of the "Bięcino" wind farm shall also not infringe the legislation applying to the Natura 2000 sites.

9. DIAGNOSIS OF THE POTENTIALLY SIGNIFICANT ENVIRONMENTAL IMPACTS OF THE PLANNED INVESTMENT, INCLUDING TRANS-BORDER IMPACTS AND DESCRIPTION OF THE APPLIED PROJECTION METHODS

9.1. Impacts resulting from presence of the investment

1. **At the construction stage** (the investment does not exist yet), the following shall take place:
   a) transformations of surface lithospheric layer (excavations),
   b) liquidation of soil cover,
   c) liquidation of vegetation (mainly agrocenoses),
   d) impact on fauna (primarily soil and deterring of the remaining fauna),
   e) emission of pollution to atmosphere (vehicles and construction machinery),
   f) noise emission (vehicles and construction machinery),
   g) waste production (mainly soil from excavations).

These impacts shall not be significant in the meaning of environmental protection provisions.

2. **At the exploitation stage** of the investment, with regard to its presence, the following shall occur:
   a) reduced emission of pollution to atmosphere from conventional energy sources
   b) noise emission by power plants,
   c) infrasound emission by power plants,
   d) electromagnetic radiation emission by transformer station,
   e) hazardous waste production,
   f) potential impact on avifauna,
   g) potential impact on chiropterofauna,
   h) landscape anthropization,
   i) impact on human living conditions - cumulative impact.

Potentially significant impacts include the ones listed in clauses a, b and h. With a view to noise emission (clause b) it was demonstrated that its permissible levels shall not be exceeded (chapter 7.2.5.).

3. **At the decommissioning stage** (end of operation of the investment), the following will take place:
   a) emission of pollution to atmosphere (vehicles and demolition machinery),
   b) noise emission (vehicles and demolition machinery),
   c) construction material waste production.

The potentially significant impacts will include waste production.

Classification of environmental impacts of the planned investments, including potentially significant impacts, pursuant to Article 66 of the Act of 3 October 2008 on the provision of information on the environment and its protection, public participation in environmental protection and environmental impact assessments (Journal of Laws of 2008 No. 199, item 1227 as amended) is provided in chapter 8.8.

9.2. Impacts resulting from the use of natural resources

The planned investment shall cause no use of natural resources, apart from the use of renewable, kinetic wind energy (long-term impact, permanent at windy weather conditions).

At the construction stage, the analysed investment shall require consumption of raw

materials, materials and fuels, including:

- reinforcement steel - approx. 1150 t;
- concrete - approx. 14 000 m^3;
- aggregate - approx. 33 000 m^3;
- water (for utility purposes) - approx. 90 m^3;
- fuel for construction equipment (including for energy generation in the aggregates) and for transport purposes (approx. 280 t).

9.3. Impacts related to decommissioning or limited access to natural environment resources

The issue of legal protection of utility resources of natural environment in the location of the "Bięcino" wind farm applies to soil protection.

Soil protection

Pursuant to the Act of 03.02.95 on the protection of agricultural and forest areas (uniform text in Journal of Laws of 2004 No. 121, item 1266 as amended), agricultural lands of higher quality classes and organogenic soils are subject to legal protection. Pursuant to the Act:

"Non-agricultural and non-forest use of:

1) agricultural lands constituting arable lands of classes I-III, provided that their dense area intended for such use exceeds 0.5 ha - requires the consent of the Minister of Agriculture and Food Economy [currently the Minister of Agriculture and Rural Development];

2) forest lands constituting the property of State Treasury - requires the consent of the Minister of Environmental Protection, Natural Resources and Forestry [currently the Minister of Environment] or a person authorised by it;

3) (deleted)

4) (deleted)

5) other forest lands;

requires the consent of the marshal of the voivodeship expressed upon obtaining of the opinion of agricultural chamber."

With regard to the planned investment, the need for exclusion from agricultural production of arable lands constituting arable lands class III and IV is estimated (this applies to the areas of direct location of wind power plants and their assembly yards and access roads). Pursuant to this Act, the protected soils include *arable lands classes I-III, provided that their dense area (...) exceeds 0.5 ha*. Soils of lower quality classes are not protected.

With a view to implementation of the investment, no need for changing the use of forest areas for non-forest purposes will occur.

9.4. Impacts related to the potential environmental pollution

With a view to environmental pollution, the planned investment will cause noise emission (long-term impact, permanent at windy weather conditions) and infrasounds and will be the source of waste production.

There is no risk of exceeding the permissible noise levels at the areas of current settlement development and residential and service areas. The planned wind farm can operate without any restrictions at full sound power both at day and night. The acoustic analysis presented in this "Report..." (see chapter 6.2) should be verified on the basis of actual status, which will be stated on the basis of the measurements performed under the post-implementation noise monitoring (see chapter 14).

Infrasound emission by the modern wind farms is insignificant and poses no adverse

impact on humans.
The planned investment poses no risk of excessive emission of electromagnetic radiation.
Waste will be produced at the construction, exploitation and decommissioning stage of the investment. At the construction stage, these will include mostly soil and ground waste and in lesser degree construction material waste, whereas at the exploitation stage hazardous waste (requiring special treatment) can be produced and at the decommissioning stage - primarily construction material waste. Rules for waste handling are regulated by the Act on waste (Journal of Laws of 2001 No. 62, item 628 as amended) and implementing legislation thereto.

9.5. Limited use areas

The planned "Bięcino" wind farm does not belong to the investments for which the limited use area is established[15].
The adopted technical, technological and organisational solutions shall ensure elimination of negative environmental impact, including on human living conditions. The areas falling within the range of noise impact of the power plants will remain in current agricultural use (pursuant to the "Local spatial development plan for the Damnica Commune, Bięcino and Karżniczka precincts, adopted by the Resolution No. XLVIII/331/10 of the Damnica Commune Council of 21 April 2010 in force).

9.6. Trans-border environmental impact

The "Bięcino" wind farm, due to the scale of investment and location in a distance of approx. 20 km + 12 sea miles from the border of Poland (Polish territorial waters border on the Baltic Sea) shall cause no trans-border environmental impact.

9.7. Risk of severe failures

The "Bięcino" wind farm, due to no processing, production or storage of hazardous substances (at no stage, i.e. construction, exploitation and liquidation) is not included into the plants of increased risk or high risk of severe industrial failures.
At the investment stage, the risk of failure may apply only to the potential disturbances in operation of the mechanical equipment used during the construction and assembly woks (e.g. leakage of petroleum products) and pose a threat to water and soil environment. Preventing such failures will be possible by:

- continuous monitoring of equipment used at the wind farm construction and assembly stage with a view to potential leakages and failures;
- carrying-out any potential repairs of mechanical equipment in adjusted sites;
- delivery of the investment by qualified and skilled construction workers.

The investment exploitation state will be associated with the potential theoretical failures consisting in collapsing or damaging the structure of power plant tower. Probability of such situation is very low. Continuous monitoring of operating parameters of individual power plants and of potential damages decreases the probability of such failure. Nevertheless, in the case of the potential occurrence of such failure, no risk to humans will take place due to significant distance from residential development (minimum distance from residential development to the nearest power plant is approx. 500 m).

[15] Pursuant to the "Environmental Protection Law" Act (uniform text in Journal of Laws of 2008 No. 25 item 150 as amended), the limited use area is established for *"sewage treatment plants, municipal waste landfills, composting plants, transport route, airport, power lines and stations and radio communications station, radio-navigation and radio-location station"*.

9.8. Environmental impact classification

Classification of environmental impacts of the planned investments, at the construction and exploitation stage, pursuant to Article 66 of the Act of 3 October 2008 on the provision of information on the environment and its protection, public participation in environmental protection and environmental impact assessments (Journal of Laws of 2008 No. 199, item 1227 as amended) is presented in tables 22 and 23.

Table 22 Classification of environmental impacts of the planned investment at the construction stage

No.	CLASSIFICATION CRITERIA / IMPACTS	Impact spatial range			Impact qualitative strength			Impact mechanism			Impact duration				Impact effect persistence	
		local	sub-regional	regional	low	medium	high	direct	indirect	cumulative	temporary	short-term	medium-term	long-term	reversible	irreversible
	Lithospheric impact:															
25.	changes to area morphology (levelling, road embankments, etc.)	X			X			X				X				X
26.	physical transformations of sub-surface geological structure (construction excavations)	X				X		X				X				X
27.	liquidation and physical transformation of soil cover (excavations and other construction works)	X					X	X				X				X
28.	subsoil pollution (emergency cases)	X			X			X			X				X	
29.	soil vibrations (construction works)	X			X			X				X			X	
	Hydrospheric impact:															
30.	periodic decrease of groundwater level (drainage of construction excavations)	X			X			X				X			X	
31.	subsoil pollution (emergency cases)	X			X			X			X				X	
32.	liquidation of hydrographic objects (construction works)	X			X			X				X				X
33.	surface water pollution (emergency cases)	X			X			X			X				X	
	Atmospheric impact:															
34.	noise emission (construction works, transport)	X				X		X				X			X	
35.	pollution emission to air (construction works, transport)	X			X			X				X			X	
36.	climate changes (changes to the nature of active surface)	X			X				X			X			X	
	Biospheric impact:															
37.	liquidation of flora and fungi (construction works)	X			X			X				X				X
38.	liquidation of plant habitats (construction works)	X			X			X				X				X
39.	liquidation of soil fauna (construction works)	X			X				X			X				X
40.	Devaluation of surface fauna habitats (construction works)	X			X			X				X				X
41.	Devaluation of flying animal habitats (construction works)	X			X			X				X			X	
	Impact on natural utility resources															
42.	soil cover loss (construction works)	X			X			X				X				X
43.	changes to recreation and tourist values of the location area and its surroundings	X				X			X			X			X	
	Anthropospheric impact (material heritage, including cultural)															
44.	damage to technical infrastructure, including road infrastructure (construction works, transport)	X			X			X				X			X	
45.	Waste production (construction works)	X			X			X				X			X	
	Impact on landscape															
46.	changes to physiognomy with progressing	X	X	X		X		X	X	X		X			X	

	construction works and the aforementioned impacts															
	Human impact (on living conditions)															
47.	change to acoustic climate (noise emission - construction works and transport)	X				X			X			X			X	
48.	changes to aerosanitary condition (pollution immission - construction works and transport)	X			X				X			X			X	
49.	soil vibrations (construction works, transport)	X			X				X			X			X	
50.	accident risk (transport)	X			X			X				X			X	
51.	changes to operation condition of technical infrastructure, including road infrastructure	X			X				X			X			X	
52.	landscape changes (increasing along with progress of construction works)	X				X			X			X			X	

Source: own study.

Table 23 Classification of environmental impacts of the planned investment at the exploitation stage

No.	CLASSIFICATION CRITERIA IMPACTS	Impact spatial range			Impact qualitative strength			Impact mechanism			Impact duration				Impact effect persistence	
		local	sub-regional	regional	low	medium	high	direct	indirect	cumulative	temporary	short-term	medium-term	long-term	reversible	irreversible
	Hydrospheric impact:															
28.	change to groundwater supply (territorial reduction of storm water infiltration)	X			X			X						X	X	
	Atmospheric impact:															
29.	noise level (operation of the power plant)	X					X	X						X	X	
30.	electromagnetic radiation emission by MRP,	X			X			X						X	X	
31.	infrasound emission (operation of the power plant)	X			X			X						X	X	
32.	reduced emission of pollution to atmosphere from conventional energy sources			X		X			X	X				X		X
33.	climatic change (operation of the power plant and changes to active surface)	X			X				X					X	X	
	Biospheric impact:															
34.	devaluation of surface fauna habitats (operation of the power plant)	X			X			X						X	X	
35.	devaluation of flying fauna habitats (operation of the power plant)	X				X		X						X	X	
36.	impact on birds (operation of the power plant and habitat devaluation), impacts a) - c) can accumulate: a) mortality; b) reduced breeding of certain species; c) feeding site loss.	 X X X			 X X X			 X X	 X	 X				 X X X	 X X	 X
37.	impact on bats (operation of the power plant and habitat devaluation), impacts a) - b) can accumulate: a) mortality; b) reduced number of flights and route changes;	 X X			 X X			 X X	 X	 X				 X X	 X	 X
	Impact on natural utility resources															
38.	change to recreation and tourist values of the location area and its surroundings	X	X			X			X	X				X	X	

39.	reduced consumption of energy resources (coal, oil, gas)			X		X			X					X		X
	Anthropospheric impact (material heritage, including cultural)															
40.	changes to the surroundings of material heritage facilities, including cultural heritage	X				X			X					X	X	
41.	changes to land value (economic impact)	X			X				X					X	X	
42.	improved technical condition of the existing roads and the new roads (access to power plant)	X	X		X				X	X				X	X	
43.	development of communal infrastructure (investing of the commune revenues from real-property taxes on wind farm)	X			X			X						X	X	
44.	waste production (renovation works)	X			X			X						X	X	
45.	reduced territorial development capacity of the other socio-economic functions, primarily settlement investing in the area of housing	X	X			X			X	X				X	X	
	Impact on landscape															
46.	changes to physiognomy (impact of surface power plant elements)	X	X	X			X	X	X	X				X	X	
	Human impact (on living conditions)															
47.	change to acoustic climate (exploitation of the power plant)	X				X		X						X	X	
48.	infrasound emission (exploitation of the power plant)	X			X			X						X	X	
49.	stroboscopic effect (exploitation of the power plant)	X			X				X					X	X	
50.	shadow flickering effect (exploitation of the power plant)	X			X				X					X	X	
51.	landscape transformation (presence and exploitation of the power plant)	X	X	X			X		X	X				X	X	
52.	improved aerosanitary conditions (in effect of reduced pollution emission - clause 4)	X	X	X	X				X	X				X	X	
53.	exploitation of roads modernised and built for the power plant	X			X				X					X		X
54.	exploitation of communal infrastructure (constructed from the commune revenues from real-property taxes on wind farm)	X			X				X					X		X
55.	individual income from land lease for wind farm and associated infrastructure	X			X				X					X	X	

positive impacts

Source: own study.

At the decommissioning stage of the "Bięcino" wind farm, these impacts will be the same as the ones at the investment implementation stage (see table 22). In addition, with regard to decommissioning of the "Bięcino" power plant, significant volumes of waste will be produced (see chapter 7.3.7.).

9.9. Cumulative impact assessment

9.9.1. Cumulative effect of environmental impacts of the "Bięcino" wind farm

The planned "Bięcino" wind farm shall contribute to increased share of environment-friendly energy sources in the energy production balance. Environment-friendliness of wind farms consists in use by them of renewable energy sources and no energy emissions of particulate matter and gases to the environment. The wind farm causes however environmental impact, in particular in the scope its physical condition (sozologic issues), nature functioning (ecological issues) and landscape physiognomy (aesthetic issues).

Sozologic issues with a view to wind farm cover primarily noise emission (energy impact). Provided that the parameters specified in this report are met, the "Bięcino" wind farm shall cause no excessive impact, harmful to humans, in this scope. At the exploitation stage, no material environmental impact will be caused by the power plants (emission of solid, liquid and gas waste) and avoidance of additional emission of gas and particulate matter pollution to air from conventional power industry will be possible. Wind power plants replace the conventional power industry based on coal, oil or gas combustion, or limit its development. Therefore they have ad-hoc or final impact on reducing the emission of combustion products to air, that is primarily of CO_2, SO_2, NO_x and particulate matter. This has a positive impact on atmospheric pollution state and should contribute to reducing the results of greenhouse effect - climatic and derived. The "Bięcino" wind farm will have its part in this process. Cumulative effect of wind farm environmental impact can be considered - in terms of sozology - as positive.

Construction and exploitation of the "Bięcino" wind farm shall cause indirect and direct impact on the ecosystems, including:

1) liquidation of natural habitats at the construction stage (assembly yards, power plant foundations, access and assembly roads) - this will apply only to agricultural ecosystems of low environmental value;
2) liquidation of vegetation at the construction stage - this will apply only to agrocenoses and ruderal vegetation of low environmental value;
3) transformation of habitats at the exploitation stage (noise impact) - low importance due to limited spatial range of impact, nature of habitats (arable lands) and adaptation capacity of biotic environment,
4) potential impact on flying animals, primarily birds and bats - as demonstrated in chapter 7.2.7., the risk of negative impact is low.

Cumulative effect of the planned "Bięcino" wind farm on ecosystems was assessed as potentially low.

As already stated (chapter 7.2.11.), aesthetic assessments of wind farms are subjective, dependent on individual feelings and inclinations and in effect extremely differentiated - from negative due to the nature of large technical structures, forming a foreign component in landscape, to positive, reflecting their sophisticated, simple and state-of-the art form. The "Bięcino" wind farm shall cause transformation of the cultural and agricultural landscape in local and sub-regional scale. The range of significant and permanent landscape impact of the "Bięcino" wind farm will cover primarily the inhabitants of villages located in direct vicinity of the investment area i.e.: Bięcino, Karżniczka, Budy and Dębniczka.

Exploitation of the "Bięcino" wind farm can cause cumulative impact on comfort of human life. The feeling of deteriorated living conditions may result from no acceptance for change of living environment (for the most landscape changes) and subjective

fears that the environmental protection standards in the scope of noise, infrasounds and electromagnetic radiation are not kept.
In general assessment, cumulative impact of the "Bięcino" wind farm shall on one hand, at the side of positive impacts, cause reduced emission of pollution to air, and on the other hand will have differentiated environmental impact, in particular on landscape changes. It should be emphasized that landscape impact will be periodic (approx. 25-30 years) - after decommissioning of wind farm, the landscape will be restored to the near-current condition.

9.9.2. Cumulative environmental impact assessment of the "Bięcino" wind farms and wind farms in its surroundings

The core of environmental impact of wind farms in sub-regional and regional scale is their cumulative environmental impact. Cumulative impact in large spatial scales applies also to landscape and human living conditions and potentially applies to birds and bats and conflicts of socio-economic functions (Przewoźniak 2012).
In the Damnica commune, no other implementations of wind farms are currently planned. In the adjoining communes, the other wind farms have been operating, followed by investment processes and planning procedures (of different progresses), aiming at location of the other wind farms (fig. 18);

- in the Potęgowo commune

– in a distance of approx. 15.6 km, the complex of 6 wind power plants in the Darżyno precinct operates (target location of 12 power plants);
– of the "Głuszyno" complexc composed of 24 wind power plants, in a minimum distance of approx. 9.3 km towards east from the planned "Bięcino" wind farm - at the stage of environmental permit application;
– of the "Głuszynko-Grapice" complex composed of 20 wind power plants, in a minimum distance of approx. 10 km towards east from the planned "Bięcino" wind farm - at the stage of environmental permit issuing;
– of the "Potęgowo Południe" complex composed of 9 wind power plants in the area of Łupawa, Grąbkowo and Darżyno villages (in a distance of approx. 14 km") - at the environmental permit application;
– of the "Wieliszewo" complex composed of 17 wind power plants in the area of Nowa Dąbrowa and Wieliszewo villages (in a distance of more than 7.8 km towards south-east) - issued environmental permit;

- in the Główczyce commune - planned implementation of 4 wind farms:

– of the "Drzeżewo III" complex composed of 14 wind power plants in the area of Wykosowo village (in a distance of approx. 15.5 km towards north-east) - issued environmental permit;
– of the "Drzeżewo II" complex composed of 16 wind power plants in the area of Będziechowo-Siodłonie-Rumsko villages (in a distance of approx. 6.7 km towards north east) - at the stage of environmental permit application;
– of the "Drzeżewo I" complex composed of 11 wind power plants in the area of Drzeżewo-Lipno villages (in a distance of approx. 3.7 km towards north east) - issued environmental permit;
– 14 wind power plants in the area of Żoruchowo village (in a distance of approx. 3 km towards east) - at the stage of environmental permit application;

- in the Dębnica Kaszubska commune - pursuant to the "Study of land development conditions and directions for the Dębnica Kaszubska commune" (2010), location of

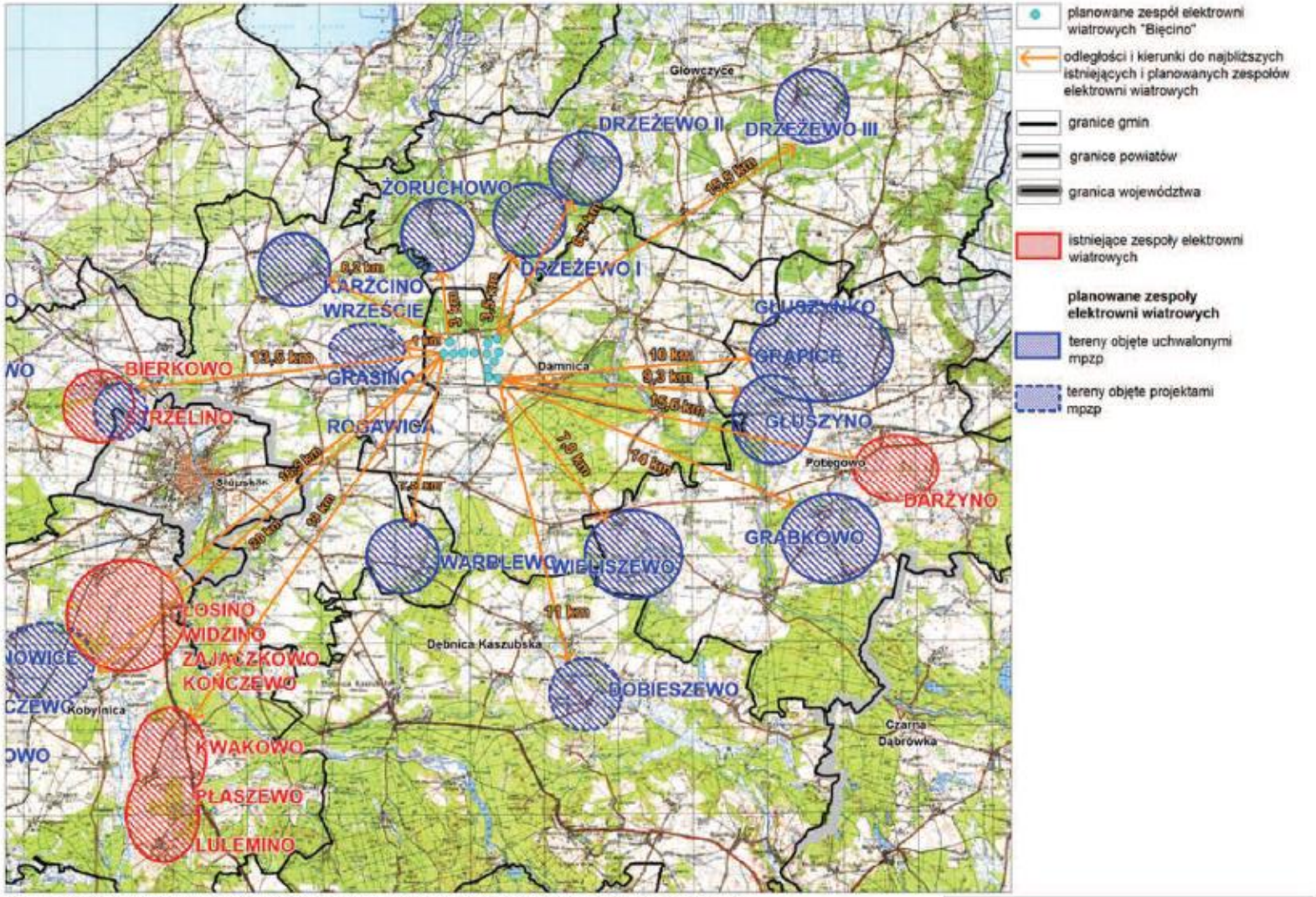
wind farms in the following geodetic precincts is planned: Skorszów Górny, Starnice, Łabiszewo, Dobieszewo, Dobra, Kotowo, Ochodza, Budowo and Jawory (the nearest of these areas - "Łabiszewo" is located in a distance of more than 11 km towards south). At the current stage, only the local plan for the Skorszów Górny precinct was drawn-up - it was however annulled by the decision of the Administrative Court in Gdansk.

- in the Słupsk commune (municipality and commune):

– in the Bierkowo, Strzelino and Słupsk precincts in a distance of approx. 13.5 km, the complex of 6 wind power plants operates;
– in the Karżcino and Wrzeście precincts in a distance of approx. 6.2 km, location of 13 wind power plants is planned (proceeding for issuing of environmental permit in progress);
– in a distance of approx. 7.4 km, in the Warlbewo precincts, under the adopted local spatial development plan, a location up to 19 wind power plants is planned;
– in a distance of approx. 1 km towards west, for Grasino and Rogawica precincts, works on the draft local spatial development plan assuming the location of wind power plants are in progress.
– for Bierkowo and Strzelino precincts, works on the draft local spatial development plan assuming the location of another wind power plants are in progress.

- in the Kobylnica commune:

– in minimum distance of approx. 16.5 km in the Łosino, Widzino, Zajączkowo and Kończewo precincts, the complex of 23 wind farms operates;
– in minimum distance of approx. 19 km in the Kwakowo, Płaszewo oraz Lulemino precincts, the complex of 18 wind farms operates;
– for Słonowice, Kończewo oraz Runowo precincts located in a distance of approx. 20 km, works on the draft local spatial development plan assuming the location of wind power plants are in progress.



Rys.18 Zespoły elektrowni wiatrowych w otoczeniu planowanego zespołu elektrowni wiatrowych „Bięcino" (1:150.000)

planowane zespół elektrowni wiatrowych "Bięcino"	planned "Bięcino "wind farm
odległości i kierunki do najbliższych Istniejących i planowanych zespołów elektrowni wiatrowych	distances and directions to the nearest existing and planned wind farms
granice gmin	commune borders
granice powiatów	poviat borders
granica województwa	voivodeship border
istniejące zespoły elektrowni wiatrowych	existing wind farms
planowane zespoły elektrowni wiatrowych	**planned wind farms**
tereny objęte uchwalonymi mpzp	areas covered with the adopted LSDPs
tereny objęte projektami mpzp	areas covered with draft LSDPs

Fig. 18 Wind farms in the surroundings of the planned "Bięcino" wind farm (1 150 000)

Cumulative environmental impact of wind farms at the stage of implementation shall be as follows:

1. Cumulated impact with the nearest wind farm in the Grasino and Rogowica precincts - wind power plants included in the nearest complex in the Słupsk commune, due to insignificant distance of approx. 1 m and no important landscape obscureness will be mostly visible at the same time. In addition, cumulative impact in the scope of noise emission is possible. At present (December 2012) location of the wind farm at this area and their total number remains unknown. Possibility of analysis of cumulative impact in the scope of noise emission with the "Bięcino" wind farm is therefore currently excluded.
2. Cumulative impact on landscape - the nearest from the planned wind farms in the Słupsk commune and the planned "Bięcino" wind farms and the remaining power plants planned nearby will form the components of anthropogenic landscape transformations, accompanying the inhabitants of surrounding villages and the persons travelling on the transport routes on everyday basis - this applies primarily to the local roads and in a lesser degree to national route No. 6 Kołbaskowo-Łęgowo crossing in a distance of approx. 4.5 km.
3. Impact on fauna, in particular avifauna, may be related to decreased attractiveness of the location of wind farms as feeding and resting sites and the potential impact as obstacles (barrier effect) - due to location of the investment outside the migration routes of birds and presence of alternative feeding sites in the surroundings (extensive arable fields) as well as large distances between wind farms planned in the neighbourhood, this risk is low at the current stage; no increase of the barrier effect will occur.

According to the conclusions from the ornithological monitoring (Antczak, 2010 – **Appendix 6**):

Construction and operation of each wind power plant may modify the route and way of animal flight, which is called the barrier effect (Wuczyński 2009). This effect may apply to birds migrating on transit basis during autumn and spring migrations as well as individuals flying locally between the nesting, resting and feeding sites. The effect of this impact is increased energy consumption which, as assumed, can lead to deterioration of animal fitness. A similar effect, consisting in accumulation of the barrier effect is so called cumulative impact, the strongest, the more wind farms are constructed near to each other. The scale of cumulative impact can vary on extensive open areas, areas of mass assembly of birds at feeding sites or in the areas of high concentrations of raptors or near breeding sites of the other species.

According to the "Guidelines..." (PSEW 2008), when analysing the cumulative impact, the two following spatial ranges should be considered:

- *in the case of bird species of extensive functional territories or areas (e.g. raptors), one should consider all farms in a radius of approx. 5 km;*
- *in the case of numerous feeding/resting assemblies (e.g. cranes, storks, golden plovers, pewits) of birds, one should analyse the farms in a radius of approx. 20 km.*

During the annual field works on the BIĘCINO WF, no larger assemblies of any bird species were recorded - the largest groups of cranes did not exceed several individuals, which, considering the scale of territorial expansion of the species and its commonness in agricultural landscape of the whole northern part of the country, should not be considered extraordinary. One should remember that, Poland, primarily its northern part, is on the migration route of approx. 100 000 of individuals of this

species twice a year, of which large part stays on arable lands or so called assembly areas gathering sometimes up to even several thousand of birds (Sikora 2009). With a view to the above, assembling and inhabiting of several or several dozen individuals can be neglected when analysing the cumulative effect.
The remaining larger species also did not stay in the extraordinary abundances - the groups of inhabiting plovers accounted for maximally 250 individuals and of ringdoves - 80 individuals. From the passerines, the largest inhabiting flocks were recorded for lark (up to 214 individuals), linnet (up to 230 individuals), sterling (up to 293 individuals) or fieldfares (up to 95 individuals), which also proves that this area has not been particularly attractive for this group. With regard to the above it should be stated that no accumulation of impact of wind farms in the scope of assembling/feeding of birds at the area of the planned investment will take place and therefore more distant farms can be excluded (up to 20 km). Formation of the barrier effect, associated with cumulative impact for birds migrating on transit basis can theoretically occur along the seasonal migration corridors. In the case of the BIĘCINO WF no strong stream of transit flights was recorded. The birds flew in so called "wide front" without a distinct migration route and the flight dynamics was low - ranged between 0.4 individual/ hour and 144.6 individual/hour (averagely 20.6 in summer and autumn and 49.3 individual/hour in spring).
(...) The third element to be discussed is the cumulative impact on the local populations of raptors, not deterred by the presence of wind farms - vast majority of raptors easily hunts between the operating turbines, in effect of which they maintain their feeding sites. On the other hand, no deterring reaction can result in the increased mortality in effect of collision.
In the case of the planned investment, no presence of nests of species covered with zone protection was recorded in a radius of 2 km. This area was the hunting site of 2 pairs of buzzard, 1 pair of marsh harrier - the most abundant raptors in the agricultural landscape of Poland. The buzzard nests throughout the entire spectrum of habitats, starting from minor field tree stands to dense forest complexes. On the other hand, nesting of marsh harrier is associated with presence of any type of water reservoirs (including small field water ponds frequent in the agricultural landscape of the Polish lowlands, including in particular Pomerania). The birds of both species hunt usually in a radius of 1-5 km from their nest, depending on the existing trophic conditions. Due to high abundance of populations of the aforementioned species, any risks for stability of their population posed by wind farms at this stage of wind power industry development can be considered marginal. The remaining raptor species were observed within the area on sporadic basis.
***To summarise,** it can be considered that at the current stage of wind farm investment development in the surroundings of the planned BIĘCINO WF, the cumulative effect shall be absent for the analysed phenomena - formation of migrant barrier, assembly of birds in the feeding/resting sites, reduction of feeding site areas for large bird species. Construction of subsequent farms in the surroundings will certainly require further analyses.*

4. Implementation of the "Bięcino" wind farms in cumulative impact with the other planned wind farms shall not affect the Natura 2000 sites, including no infringement of the network integrity - all planned wind farms are to be located outside the Natura 2000 site borders.
5. Cumulative impact on acoustic climate may occur only in local scale in the case of direct vicinity of the farms. This can apply to the planned wind farms in the Słupsk commune in the Grasino-Rogowica precincts. As already stated, at present (December 2012) location of the wind farm at this area and their total number remains unknown. Possibility of detailed analysis of cumulative impact in the scope

of noise emission with the "Bięcino" wind farm is therefore excluded.

The most important cumulative effect of environmental impact of wind farms will be their impact on landscape, that will result in change of the landscape features of the region. Dominating cultural agricultural landscape (arable and settlement) will be replaced with cultural agricultural and infrastructural (industrial landscape) with specific physiognomic dominant in a the form of wind power plant structures, perceived in large complexes, individually from various distances, in favourable weather conditions even up to approx. 20 km.

Landscape impact will be of periodic nature (approx. 25-30 years) and shall secure this area against excessive settlement investment pressure permanently devaluating the landscape.

Cumulative impact on fauna, in particular avifauna (obstacle in migration of birds of large spatial scale) can apply also to wind farms and high voltage power lines.

9.10. Description of the projection methods

Environmental impact assessment of the planned investment was performed in three stages.

Stage 1 - data collection

Search of archive materials, field eco-physiological and landscape inspection, identification of vegetation and habitats, ornithological and chiropterological monitoring of the location of the planned investment and its surroundings:

- habitat, flora and fauna inventory (excluding birds, bats and insects) included in the "Environmental inventory report for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune" (Haplicznik, Kaszewska-Mejer, Jaśkiewicz and Szmigiel 2012) - **Appendix 4**.
- inventory of entomofauna published in the "Report from entomofauna inventory for the investment consisting in construction of the Bięcino wind farm in Damnica commune" Study (Haplicznik, Lasecki, Szmigiel 2012) - **Appendix 5**.
- ornithological monitoring of the investment area (see chapter 3.2.5.3) published in the Report from avifauna monitoring for the "Bięcino" Wind Farm (Antczak 2010) - **Appendix 6** ;
- chiropterological monitoring of the investment area (see chapter 3.2.5.4) published in the "Potential impact report and assessment of the planned location of the "Bięcino" Wind Farm on bats" (Kościów 2010) - **Appendix 7**.

Stage 2 - expert assessments

Performance with so called expert method of specialist environmental impact assessments of the planned investment in the scope of impact on noise, electromagnetic radiation, landscape and avifauna and chiropterofauna or in the scope of key impacts associated with operation of wind farms.

Stage 3 - comprehensive assessment

Comprehensive environmental impact assessment, with consideration to direct and indirect impacts, secondary, cumulative, short-, medium- and long-term as well as permanent and temporary impacts.

When projecting environmental changes caused by the planned investment, the following methods were applied:

- inductive and descriptive (from detailed analysis to general synthesis);
- environmental analogy (on the basis of assumption on the stability of the laws of nature);
- mathematical modelling (noise level projection);
- diagnosis of environmental condition on the basis of field mapping as the baseline for future extrapolation;

- cartographic analyses (fig. 1 - 18 and cartographic appendix);
- photo visualisation (photos 1 - 4 - landscape change projection).

These methods are described among others in the works of Przewoźniak (1987, 1995, 1997) and in the "Problemy Ocen Środowiskowych" (Aspects of Environmental Assessments) quarterly.

10. PROPOSED ACTIONS AIMING AT PREVENTION OR MITIGATION OF ADVERSE ENVIRONMENTAL IMPACT AND ENVIRONMENTAL COMPENSATION

Preventing and mitigating the potential negative environmental impacts of the planned "Bięcino" wind farm can be theoretically achieved by:

1) applying environment-friendly technologies of construction works;
2) selection of technical parameters of the planned power plants mitigating their environmental impact;
3) mitigation of the potential impact on birds;
4) mitigation of the potential impact on bats;
5) development of scenarios for wind farm location;

The following environmental protection solutions were provided for:

Construction stage

- location of wind power plants and transformer station:
  - in a distance from residential facilities (minimum distance of approx. 500 m and more) enabling elimination of impact of excessive noise level emitted by wind power plants on humans and impact of electromagnetic field from the transformer station;
  - at the agricultural lands with no significant environmental values, including outside the areas of birds and bats concentration (confirmed with the results of annual ornithological and chiropterological monitoring):
  - adjusting to the results of environmental inventories (**Appendices 4 - 7**);
- carrying-out the construction works outside night hours (10 PM - 6 AM);
- maximum reduction of the construction site area;
- use of high-quality equipment, meeting the requirements for the machinery used outside the premises in terms of noise emission to the environment, in compliance with the Ordinance of the Minister of Economy of 15 February 2006 (uniform text in Journal of Laws No. 32/2006, item 223 as amended) in the construction and assembly works;
- shutting down of machinery and equipment during breaks at work (avoiding idle running of machinery and equipment);
- use of construction "micro-machines" (specialist mini-excavators for digging narrow trenches for cable laying purposes, manual soil thickeners of 'foot' type) at the sections adjoining the environmentally valuable areas;
- use of technologically advanced turbines maximising the production capacity of power and at the same time reducing the potential environmental impact (noise emission),
- adequate storage of removed soil layer for re-use in order to restore the initial state upon completion of the construction works;
- protecting soil and waters in the area of the investment against pollutions associated with operation of machinery;
- disposal of output from the excavations for foundations and transport of construction materials and elements of the power plants outside night hours (10 PM - 6 AM);

- utilisation of output from excavations for foundations of the power plant to reclaim post-exploitation pits and other degraded areas in the Damnica commune or its surroundings;
- securing the trees growing along the planned access routes by covering them with straw mats or nets;
- application of power grid localisation technology in soil using the ploughing method at the areas without underground infrastructure;
- excavations for MV cable lines in the vicinity of forest complexes should be performed in road and fire belt lines and in a way to not to disturb hydrographic conditions at the adjoining areas;
- in the case of modernisation of the existing roads and excavations for MV cable lines near trees, tress growing near the roads and shrubs, for the time period of works this vegetation should be protected against damage;
- excavations for MV cable lines near the trees should be performed manually without damaging the root systems;
- crossings of MV cable lines via the roads of hardened surface should be carried out with the use of drilling or jacking method and with adequate connection protections in consultation with the administrator, management or owner of the other construction facility.
- restoration of environment of the areas transformed during the construction works to the initial state, including securing the surface soil layer from the construction excavations and, upon completion of construction works, its use for area reclamation;
- selective collection of produced waste and their temporary storage until disposal at the landfill or other disposal;
- reception and utilisation of waste classified as hazardous waste (e.g. gear oils) by specialist services, in compliance with the conditions provided for in the Act on waste,
- maintaining the hydrographic conditions - prohibited backfilling of small water reservoirs and drainless basins.
- underground course of MV line with optic fibre connecting the wind power plants with the "Bięcino" MRP, delineation of its route in a way that is maximally adjusted to the existing roads and construction of the line crossings under the hardened roads with the use of controlled drilling method.
- using the power plants constructed in the advanced technology (BAT - best available technologies).

In addition, the expert studies (Appendices 4-7) developed for the purposes of implementation of the "Bięcino" wind farm, a number of recommendations aiming at minimization of the potential risk to various environmental components during the implementation, exploitation and decommissioning of the investments, are provided.
The activities listed for fauna (apart from birds and bats), are provided in chapter 7.1.8.

Birds

Pursuant to the ornithological monitoring (Antczak 2010 - Appendix 6):

- *when planning access road, circumvent field tree stands and shrubs. These areas are the breeding sites of small passerines, and can be additionally used by birds as resting sites or shelter against raptors;*

- *from the same reason, planting the access roads with shrubs can be suggested to increase general biodiversity. Such activity is of compensation nature against any losses in the local and migrating avifauna of small passerines.*

The above recommendations of the ornithological monitoring (Antczak 2010 - Appendix 6) were considered in the final positioning of the wind power plants in the "Bięcino" wind farm and planned system of access roads in the scenario of the investment to be implemented.

Bats

Pursuant to the guidelines drawn-up and published in December 2009 by the Association for Bats Protection (PON) and recommended for use among others by the National Nature Conservation Council, it is recommended to:

1. Do not use artificial lighting of the investment area e.g. lanterns, illumination of turbines and masts (excluding the lighting required by the other provisions of law) - such lights attract the insects ensuring easy feeding site for bats.
2. Do to plant forest on agricultural areas within the planned investment and do not introduce trees and shrubs, in particular of continuous nature (e.g. road tree lanes) that might become the new migration routes and ecological corridors used by the bats.
3. It is recommended to prevent growing of tree stands and shrubs (e.g. in effect of natural dispersion) in particular of continuous nature (as above) on the lands leased by the investor, including near access roads to the wind power plants.

Pursuant to the guidelines drawn-up and published in December 2009 by the Association for Bats Protection (PON) and recommended for use among others by the National Nature Conservation Council and chiropterological monitoring (Kościów 2010- **Appendix 7**), it is recommended to:

Pursuant to the recommendations of "Guidelines" to the bats monitoring it should be recommended to localise the wind power plants in a distance of approx. 200 meters from the edge of dense forest complexes. In the case of wind farm analysed in this report, this recommendation would apply to southern areas of the Bięciński Forest edges. Maintenance of such buffer zone should minimise the potential impact of PP7 power plant on bats (primarily common noctules featuring high collision capacity) that could feed in the ecotone of the forests and arable fields. The requirement of maintaining the 200-meter buffer zone should be also applied to the alley on the bricked road Bięcino-Karżniczka - with regard to PP11 and PP12 power plants near which the flights and hunting by bats along the alley have already been observed. If however, due to design-related reasons, increasing the distance from the identified habitats of these wind power plants up to approx. 200 m is impossible, activities minimising the collisions and barotrauma should be introduced from the day of launching of the PP7, PP11 and PP12 power plants by periodic shutting down of the power plant between July to end of October each year during precipitation-free nights,when wind speed at the height of gondolas of the aforementioned wind power plants (PP7, PP11 and PP12) drops below 6 m/s, that is where 60-90% of collisions take place and energy production is low (Baerwald et al. 2009). If the post-implementation monitoring demonstrates lower activity of the bats in the PP7, PP11 and PP12 area, absence or low mortality of bats than estimated (upon introducing this recommendation), the restrictions should be mitigated upon completion of the post-implementation monitoring in line with the expert recommendations.

The above recommendations of the chiropterological monitoring (Kościow 2010 - Appendix 7) were considered in the final positioning of the wind power plants in the "Bięcino" wind farm and planned system of access roads in the scenario of the investment to be implemented.

Exploitation stage

- covering the "Bięcino" wind farm with permanent technical supervision minimising the risk of failure of equipment (power plants and MRP station). In addition, the "Bięcino" wind farm will be covered with periodic monitoring in the scope of:

– acoustic impact in order to ensure compliance with the acoustic standards in force at the protected areas in direct vicinity of the wind farm. In the case of any potential excesses, the wind farms will be silenced);
– impact on birds and bats in order to determine actual bird mortality (if present) in effect of wind turbines operation;
– decreasing the sound power of the individual power plants to mitigate their impact on acoustic climate of the environment, only in the case of stating the exceeding of noise levels at the stage of post-implementation monitoring preparation (required compliance with the standards at the areas with protected functions, which is met according to the performed acoustic analysis - chapter 6.2. or considering the cumulative impact - chapter 9.9.2.);

- reception and utilisation of waste classified as hazardous waste (e.g. gear oils) by specialist services, in compliance with the conditions provided for in the Act on waste,
- applying uniform and non-contrasting with the surroundings colour palette of the power plant structure in order to reduce impact on landscape,
- eliminating the stroboscopic effect by applying specialist paints covering the power plant structures;
- equipping the transformer station in oil sumps and systems of monitoring and separation of oil from storm waters in order to minimise the risk of leakage of transformer oil to the environment,
- placement of wind power plants on cylindrical solid walls, which in contrary to the truss towers (or frame-strut towers) provide the birds with no nesting options and therefore do not attract them additionally in the vicinity of wind farms,
- constructing the similar type of wind power plants to not to differentiate the internal structure of the complex and limit its landscape impact;
- constructing the power plants of uniform height in order to reduce the area of potential contacts with flying animals;
- placing no advertisements on the structure of power plants to reduce their landscape impact (does not apply to investor or turbine producer logos);
- using for painting of the structure of power plants of matt white to light grey colours in the upper parts of the structure (this colour causes the best effect of camouflaging the power plants in the landscape in particular during cloudy weather) and possibly the green shades at the foot of the tower (this procedure will reduce contrast of power plant against the vegetation);

Liquidation stage

- performance of demolition works outside the breeding period of vast majority of identified birds i.e. outside March - mid-July;
- carrying-out the demolition works outside night hours (10 PM - 6 AM);
- maximum reduction of the demolition site area;
- use of high-quality equipment, meeting the requirements for the machinery used outside the premises in terms of noise emission to the environment, in compliance with the Ordinance of the Minister of Economy of 15 February 2006 (Journal of

Laws No. 32/2006, item 223) in the demolition works;

- shutting down of machinery and equipment during breaks at work (avoiding idle running of machinery and equipment);
- use of construction "micro-machines" (specialist mini-excavators for digging narrow trenches for cable extraction purpose) at the sections adjoining the environmentally valuable areas;
- adequate storage of removed soil layer from excavations for re-use in order to restore the initial state upon completion of the cable decommissioning;
- protecting soil and waters in the area of the demolition works against pollutions associated with operation of machinery;
- transport of waste outside night hours (10 PM - 6 AM);
- securing the trees growing along the planned access routes by covering them with straw mats or nets;
- excavations near the trees should be performed manually without damaging the root systems;
- decommissioning of MV cable lines under the roads of hardened surface should be carried out with the use of non-excavation method and with adequate connection protections in consultation with the administrator, management or owner of the other construction facility.
- restoration of environment of the areas transformed during the cable decommissioning to the initial state, including securing the surface soil layer from the excavations and, upon completion of construction works, its use for area reclamation;
- selective collection of produced waste and their temporary storage until disposal at the landfill or other disposal;
- reception and utilisation of waste classified as hazardous waste (e.g. gear oils) by specialist services, in compliance with the conditions provided for in the Act on waste,

11. ANALYSIS OF POSSIBLE SOCIAL CONFLICTS ASSOCIATED WITH THE PLANNED INVESTMENT AND CURRENT SOCIAL CONSULTATIONS UNDER THE PROJECT

The designed "Bięcino" wind farm with associated infrastructure is to be implemented:

- in a distance of approx. 3 km from the area of community importance "Dolina Łupawy" PLH220036 (Łupawa River Valley) and a few ecological sites;
- in a distance of few - several kilometres from the other territorial forms of nature conservation (including national parks, nature reserves, landscape park, protected landscape areas and Natura 2000 sites, including the special protection area "Pobrzeże Słowińskie" PLB220003 (Słowińskie Coastal Region);
- in a distance of approx. 12.5 km from the Słowiński National Park;
- in a distance of approx. 14.8 km from the "Dolina Słupi" (Słupia River Valley) Landscape Park;
- in a distance of approx. 14.2 km from the Pas Pobrzeża na Wschód od Ustki (Coastline towards East from Ustka) protected landscape area;
- near Bięcino, Karżniczka, Budy and Dębniczka villages and slightly greater distance from Rogowica, Grąsino and Damnica commune village;
- surrounded by the other existing and planned wind farms (see chapter 9.9.2.).

Following these conditions, with regard to the planned construction of the "Bięcino" wind farm, the following social conflicts may arise due to:

1) protest of ecologists and so called pseudo-ecologists[16] against the location of wind farm near the nature and landscape protection forms,
2) protests of inhabitants of the surrounding villages, from among of whose some people may protest in fear of deterioration of their living conditions, including against:

- excessive noise, infrasounds and electromagnetic radiation;
- deterioration of landscape values of the surrounding areas and optic effects.

Ad. 1)

Protest against the location of the "Bięcino" wind farm in a distance of approx. 3 km from the area of Community importance "Dolina Łupawy" PLH220036 and in a distance of approx. 12.5 km from the special protection area "Pobrzeże Słowińskie" PLB220003, as demonstrated in the "Report...", would be deprived of content-related bases - the planned investment will cause no risk to natural values protected in these areas (see chapter 7.1.9., 7.2.12. and 7.3.11.).

Protest against location of the "Bięcino" wind farm in direct vicinity of the Słowiński National Park, Dolina Słupi Landscape Park and protected landscape area can refer primarily to landscape anthropization - statements (slogans) such as: damage, devaluation or devastation of landscape may appear. In reality, the landscape of the location of the investment and its surroundings will be transformed from natural and cultural landscape of open areas into natural and cultural landscape with specific components of modern, environment-friendly technology. Wind power plants will be hardly visible or not visible from these forms of nature conservation and infringe no provisions in force in their borders. Impact on wind power plants on landscape of these areas will be low (see chapter 7.2.11.). Such protest would have no formal and

[16] Ecologist is the representative of biological science discipline, subject-matter of which are the studies of interrelations and associations between the organisms or their populations and their environments. Pseudo-ecologist is a representative of any other profession, preaching (from different reasons) and in rare cases implementing the pro-ecological beliefs.

legal bases.

Ad. 3)

There are no objective health prerequisites for occurrence of social conflicts in fear of excessive noise, in the aspects of the permissible noise level standards in force. There are also no objective health prerequisites for occurrence of social conflicts in fear of infrasounds (emission from technologically advanced power plants is very low).

The issue of impact of the planned wind farm on landscape was presented in chapter 7.2.11. Since landscape perception is always subjective and dependent on individual feelings, any potential protest in this area will be also subjective and therefore emotionally intensive. As already mentioned, aesthetic assessments of wind farms are extremely differentiated - from negative due to the nature of large technical structures, forming a foreign component in landscape, to positive, reflecting their sophisticated, simple and state-of-the art form.

As the practice demonstrates, the source of conflicts in the case of locations of the power plants are also of financial nature. These results for the most from the fear of drop of land prices. As demonstrated in chapter 7.2.14, operation of the power plants shall not affect agricultural activity, with regard to which the lands as arable lands will not lose its value.

Escalation of social protests with regard to concentration of numerous wind farms in the neighbourhood may appear.

Within the proceeding on environmental impact assessment on the planned investment related to issuing of the decision on environmental conditions and consent for implementation of the investment, ensuring social participation is required. The rules of social participation in the proceeding on the environmental impact assessment of the investment are laid down in the provisions of the Act of 3 October 2008 on sharing information about the environment and its protection, public participation in environmental protection and on the environmental impact assessments (Journal of Laws No. 199, item 1227 as amended).

12. PROPOSED MONITORING OF ENVIRONMENTAL IMPACT OF THE PLANNED INVESTMENT

The planned "Bięcino" wind farm, upon putting into exploitation, shall require monitoring in the scope of:

1) environmental noise level measurements,
2) control of the construction site in the scope of direct impact on insects, amphibians and reptiles;
3) control of potential impact on bird behaviours and mortality;
4) control of potential impact on bats.

Ad. 1)

To assess acoustic climate changes in the area of the "Bięcino" wind farm, at least two measurement cycles of noise level in the environment should be performed.

The first measurement cycle should be performed upon obtaining a building permit, however before commencement of the construction works or upon implementation of the investment along with the second cycle, with non-operating turbines. These measurements will present the existing condition of acoustic climate and act as the reference point for assessing the changes occurring in effect of construction of the wind farm. Measurement points should be located near the edge residential buildings or homestead development of the nearest localities. Localisation of the points should be selected in a way to avoid impact of household noise from the development on the measured sound level.

The second measurement cycle should be performed upon construction and putting into exploitation of the planned wind farms in the same measurement points. These measurements should be performed in possibly the same conditions (time of the year, vegetation, temperature, wind power) comparing to the conditions of the first measurement cycle. The measurements should be performed in compliance with the rules of the Ordinance of the Minister of Environment of 4 November 2008 on the requirements for performance of emission volume measurements and water intake measurements (Journal of Laws No. 206, item 1291)

When any exceeding of the permissible noise level is stated, one should decrease the settings of the nearest power plants to the measurement points, in which the exceeding was stated and perform the control measurements.

Repeated control measurements may become necessary in the case of construction near the "Bięcino" wind farm of the other wind farms in distances that can affect cumulative formation of acoustic climate.

Ad. 2)

Pursuant to the mammal, reptile and amphibian inventory (Haplicznik, Kaszewska-Mejer, Jaśkiewicz, Szmigiel 2012) - **Appendix 4**, the construction works should be performed under the herpetologist supervision. If amphibian migration in the areas of planned access roads is stated, it will be necessary to continue the works in line with the herpetologist recommendations

In addition, pursuant to the entomofauna inventory (Haplicznik, Lasecki, Szmigiel 2012) - **Appendix 5**

In the case of tree logging entomological supervision consisting in inventory of trees intended for logging with a view to presence of protected beetles, in particular of Osmoderma eremita, is recommended. When the beetle is present in the cut tree, the mitigating activities aiming at transfer of stated larvae and sclerities to the replacement site in line with the recommendations of supervising expert in entomology should be taken.

Ad. 3)

On the basis of annual pre-implementation monitoring (Antczak 2010 - **Appendix 6**):

Implementation of the planned "BIĘCINO" farm should associate with the need for commencement of post-implementation monitoring. In effect of monitoring activities upon construction of the wind farm, actual impact of the investment on avifauna can be assessed. Post-implementation monitoring, as in vast majority of the locations, should last for at least 3 years within 5 years following the launching of the wind farm. Selection of years (e.g. in the 1st, 2nd and 3rd year or 1st, 3rd and 5th year) can depend on arrangements with the investor and the authorities issuing the environmental decisions (PSEW 2008).

The aim of post-implementation fauna monitoring will include:

- *formulation of empirical impact assessment of wind farm on breeding, migrating, inhabiting and wintering avifauna present within its area and in its direct vicinity,*
- *verification of the assessment of the potential investment impact, drawn-up at the pre-investment stage,*
- *analysis of actual effects of impact of the operation of this wind farm on birds in this part of Pomerania.*

Observations and information collected during the works should be used for performance of the risk assessment for birds and proposing of the potential remedial or compensation activities. Monitoring should be performed by the persons professionally trained in performing such surveys (scientific personnel) or amateurs with high field survey skills (in this case - under technical supervision of the coordinator skilled in ornithological surveys).

Surveys carried out during the post-implementation monitoring should be composed of the following basic modules:

- *observations within the investment area being the copy of monitoring performed at the pre-investment stage;*
- *observations outside the turbine operation zone being the copy of pre-investment surveys;*
- *observations of bird behaviours and reactions on the operating or non-operating wind power plants;*
- *documentation of all cases of collision victims.*

For the planned investment a framework division of tasks with minimum and necessary for correct assessments number of field monitoring surveys is proposed. The scope of works along with detailed schedule of post-implementation (post-investment) monitoring should be drawn-up specially for the "BIĘCINO" wind farm upon its construction, with consideration to the final location of turbines and access roads.

This proposal of post-implementation monitoring of Antczak (2010) is compliant with the "Guidelines for impact assessment of wind farms on birds" (2008, PSEW Szczecin).

Ad. 4)

Pursuant to the "Temporary guidelines for wind farm impact on bats (version II, December 2009)", it is necessary to perform at least three-year post-investment monitoring covering bat mortality survey and record of their activity near the towers, following the guidelines valid for the period of the farm operation.

13. LIST OF DIFFICULTIES RESULTING FROM TECHNOLOGICAL OR KNOWLEDGE GAPS AND IDENTIFIED AT THE REPORT PREPARATION STAGE

When preparing the "Report on environmental impact of the "Bięcino" wind farm and associated elements (Damnica commune, Słupsk poviat, Pomeranian voivodeship") no difficulties resulting from technical or knowledge gaps, excluding lack of knowledge on flora and fauna, were stated.
In order to fill this gap in the area of the "Bięcino" wind farm location, the following were performed:

- habitat, flora and fauna inventory (excluding birds, bats and insects) included in the "Environmental inventory report for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune" (Haplicznik, Kaszewska-Mejer, Jaśkiewicz and Szmigiel 2012) - **Appendix 4**.
- inventory of entomofauna published in the "Report from entomofauna inventory for the investment consisting in construction of the Bięcino wind farm in Damnica commune" Study (Haplicznik, Lasecki, Szmigiel 2012) - **Appendix 5**.
- ornithological monitoring of the investment area (see chapter 3.2.2.3) published in the Report from avifauna monitoring for the "Bięcino" Wind Farm (Antczak 2010) - **Appendix 6** ;
- chiropterological monitoring of the investment area (see chapter 3.2.2.4) published in the "Potential impact report and assessment of the planned location of the "Bięcino" Wind Farm on bats" (Kościów 2010) - **Appendix 7**.

14. SOURCES OF INFORMATION FORMING A BASIS FOR PREPARATION OF THE REPORT

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15. LIST OF CARTOGRAPHIC AND PHOTO DOCUMENTATION

List of figures:

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16. NON-TECHNICAL REPORT SUMMARY

1. LEGAL BASES AND SCOPE OF THE STUDY

The subject-matter of the study is the environmental impact assessment report on the planned "Bięcino" wind farm located in the Damnica commune and consisting in 13 wind power plants of total power up to approx. 39 MW and access roads, assembly yards and power infrastructure; MV/110 kV power station, MV lines and optic fibre. The "Bięcino" wind farm with impact zone will be situated within the geodetic precincts of Bięcino and Karżniczka (Damnica commune).
The Report was drawn-up pursuant to the Act of 3 October 2008 on the provision of information on the environment and its protection, public participation in environmental protection and on the environmental impact assessments (Journal of Laws of 2008 No. 199, item 1227 as amended) and Ordinance of the Council of Ministers of 9 November 2010 concerning specification of the investments of potentially significant environmental impact (Journal of Laws No. 213, item 1397), with regard to the application for issuing a decision on environmental conditions of the investment, on the basis of the decision of the Head of Damnica Commune (Appendix 1 to the "Report...").

2. DESCRIPTION OF THE PLANNED INVESTMENT Planned investment - baseline scenario

The "Bięcino" wind farm will be composed of, in the baseline scenario selected for implementation, the following essential elements;

7) 13 wind farms of the power up to approx. 3 MW each, placed on reinforced-concrete foundations and equipped with assembly platforms of hardened surface,

8) access roads connecting the wind farms with public roads,

9) modernised forest, commune, poviat and voivodeship roads and necessary exits from these roads,

10) MRP power station >Bięcino< MV/110 kV,

11) cable (underground) MV power grid connecting the wind farms with subscriber MRP power station of approx. 6 km length,

12) cable (underground) telecommunications network connecting the power plants with automatic control station,

Within the planned investment, turbines meeting the following parameters are anticipated:

4) maximum power up to approx. 3 MW (each),

5) maximum height at the highest rotor blade position of 170 +/- 5 %, including tower up to 120 m +/- 5 %.

6) maximum sound power at the level not exceeding the maximum permissible noise level as laid down in the environmental protection law, at the borderline of the residential housing areas or any other development intended for permanent stay of inhabitants and at the borderline of such areas delineated in the local spatial development plans.

In addition, all power plants shall meet the following requirements:

- marking of aviation obstacle (external ends of rotor blades painted in 5 stripes of equal width, perpendicular to the rotor axis and covering 1/3 of the rotor length - 3

red or orange stripes and 2 white);
- steel tower structure - pipe and solid structure;
- power plant structure in white or grey colour (harmonised colour palette for the entire wind farm);
- prohibition of installing advertising billboards, excluding the signs (logos) of manufacturer or investor or equipment owner.

Total area intended for the location of "Bięcino" wind farm with technical infrastructure (wind power plants and their assembly yards, access and assembly roads) will be **~6.5 ha**. The investment will require temporary occupation of part of the areas intended for implementation of the investment (for the construction period). This will apply to assembly yards of the wind farm, routes of MV power cable lines etc. Upon completion of the construction stage within these areas, their previous function will be restored (e.g. agricultural).

Investment scenarios and their assessment

Apart from the baseline scenario of the investment (presented above) the scenario of no delivery of the investment (zero scenario) and alternative scenarios were analysed:

1. The zero scenario would be the most advantageous for the environment of the investment area and its surroundings, however also unadvantageous in terms of global emission of energy pollutions to air and counteracting climate change (a conventional energy source would have to be built in the other location instead of a source of so called clean energy).
2. The alternative scenarios assumed location of the higher number of wind power plants and possible use of turbines of higher sound power (louder however generating more power) which would require occupation of the new areas for investment purposes (including placement of additional wind power plants, their assembly years and construction of the new sections of access roads) and would cause higher noise emission (requiring attenuation and reducing the volume of generated power), increased environmental impact and potentially higher impact on birds and bats.
3. The scenario-based routes of the MV cable line with optic fibre line would require among others tree stand logging on the routes and in the case of scenario of delivery of the overground line - significant landscape impact.
4. The scenario selected for implementation was prepared with consideration to the requirements included in the environmental monitoring and for delivery of the cable line - minimising tree logging and maximum association of the routes to the existing road lanes. This scenario has limited impact on vegetation, minimises risk to birds and bats of this area and reduces noise nuisance at the areas of residential housing development. This scenario is most advantageous for the environment, which is confirmed by this "Report".

Land use conditions at the investment construction and exploitation stages

Within the investment process, the need for temporary exclusion of the areas of location of the structures, adjoining assembly yards, temporary storage yards and areas of access roads (including the sections of the existing roads) and the cable line routes will occur.

Upon completion of the assembly works, the temporary storage yards around the wind farm and cable line routes will be reclaimed and restored to the original use. Only the areas of placement of foundations of the power plant, assembly yards and their access roads shall be excluded from agricultural use on permanent basis. Access roads will be made public.

In the exploitation stage, in the range of excessive noise emitted by the power plants, location of residential housing, homestead and protected service development will be excluded - this complies with the provisions of the "Local Spatial Development Plan in the Damnica Commune, Bięcino and Karżniczka precincts".

The solutions protecting the environment in the project scenario selected for implementation - the most advantageous scenario for the environment

Wind farms are a source of so called clean energy. Their use, thanks to replacing the conventional energy sources, contributes to reduced emission of CO_2, SO_2, NO_x and particulate matter to atmosphere, which brings advantageous environmental effects in local (reduced air pollution, better aero-sanitary conditions for human life) and global (reduced the climate and derivative effects of the greenhouse effect). The use of renewable energy sources complies with the sustainable development principles and is required by the international obligations of Poland, in particular these resulting from our membership in the European Union and accession to the Kyoto Protocol. At the same time, the wind farms are the investments that might have the potentially significant environmental impact, in particular in the field of noise emission, impact on birds and landscape.

At the design stage for the planned wind farm, the following environment protecting solutions were adopted:

- locating the wind farm in a distance from residential development (reducing noise impact), on the agricultural areas (deprived of ecological values), outside the protected landscape areas (in order to preserve their protected values) and in safe distance from the Natura 2000 sites (in order to eliminate significant impact on the protected fauna and flora species and on their habitats);
- applying similar type of power plants in the planned wind farm and non-contrasting with the surroundings colour palette in order to reduce impact on landscape;
- equipping the transformer station in oil sumps and systems of monitoring and separation of oil from storm waters in order to minimise the risk of leakage of transformer oil to the environment,
- underground route of the MV line and optic fibre line, delineating its course in association with the existing roads or within the arable lands and delivery of the line crossings via watercourses using the controlled drilling method (in compliance with the arrangements with the watercourse administrator) - minimising the environmental impact

3. SPECIFICATION OF NATURAL ENVIRONMENT

The location of the investment is situated entirely within the plateau of the ground moraine upland. Topography in the investment area is uniform and without significant height differences. Only in the south-eastern part of the investment area (in a minimum distance of approx. 400 m from the nearest planned wind power plant) topography is diversified with a small moraine trough.

Ordinates within the location of the investment range between approx. 80 m above sea level in the south-eastern part of the investment area and approx. 85 m above sea level in its central part. The surface area generally declines towards south and to the Charstnica River Valley (the river crosses in a distance of approx. 1.4 km from the nearest planned wind power plant).

Vegetation of the area has no specific features in terms of botany. It is represented primarily by agrocenoses of agricultural lands (partially wastelands), meadows and pastures with tree stands and shrubs patches and lanes. Large forest complexes are situated near the location of the wind farm and on the route of the MV cable line and

optic fibre line.
Natural environment of the location of the "Bięcino" wind farm and its surroundings is largely anthropized, primarily in effect of dominating agricultural use of lands. The effect of this is for the most synanthropization of vegetation and impoverishment of ecological structure.
The areas of the planned location of wind power plants and transformer station are covered only with agrocenoses of arable lands with periodic segetal vegetation.
Forest complexes are present on the route of the MV cable line and optic fibre line. Cable route was delineated along the roads existing within them.
Within the location of wind power plants and planned access roads the following was performed:

- Environmental inventory report for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune (Haplicznik, Kaszewska-Mejer, Jaśkiewicz and Szmigiel 2012).
- Report from entomofauna inventory for the investment consisting in construction of the Bięcino wind farm in the Damnica Commune (Haplicznik, Lasecki and Szmigiel 2012).
- Report from avifauna monitoring for the "Bięcino" Wind Farm (Antczak 2010).
- "Report and assessment of the potential impact of the planned location of the "Bięcino" wind farm on bats" (Kościów 2010)

The result of all these studies was used in the "Report...".
During bird monitoring throughout the area of the planned investment, the presence of 85 species in total was confirmed, vast majority of which are the species subject to strict protection (table 4). In addition, 12 from the identified species are included in Annex I to the Birds Directive.
For bats, all species identified during monitoring (Natterer's bat, common pipistrelle, Nathusius' pipistrelle, common noctule and brown long-eared bat) are subject to strict protection (Ordinance of the Minister of Environment of 12 October 2011 on the species protection of animals - Journal of Laws of 2011 r, No. 237, item 1419). None of the identified species is listed neither the Polish Red Book of Animals nor in Annex II to the Council Directive 92/43/EEC.4.2.

4. NATURE PROTECTION FORMS IN THE LOCATION OF THE INVESTMENT

The area of the "Bięcino" wind farm is located outside the spatial forms of nature conservation.
IN the surroundings of the location of the investment (in a distance up to approx. 20 km) the following spatial forms of nature and landscape protection are established:

- **nature reserve**, including:
  - **"Jałowce"** - in a minimum distance of approx. 12.5 km towards north-east from the nearest planned location of the wind power plant;
  - **"Bagna Izbickie"** - in a minimum distance of approx. 17 km towards north-east from the nearest planned location of the wind power plant;
  - **"Torfowisko Pobłockie"** - in a minimum distance of approx. 18.7 km towards north-east from the nearest planned location of the wind power plant;
- **"Dolina Słupi" (Słupia Valley) Landscape Park** - in a minimum distance of approx. 14.8 km towards south from the nearest planned location of wind power plant (approx. 6 km to the Park buffer zone);
- **protected landscape areas:**

- **Pas Pobrzeża na Wschód od Ustki (Coastline towards East from Ustka)** - in a minimum distance of approx. 14.2 km towards north east from the nearest planned location of wind power plant;

- **Natura 2000 sites**, including:

- **Pobrzeże Słowińskie" (Słowińskie Coastal Region)** special protection area - in a minimum distance of approx. 12.5 km towards north from the nearest planned location of wind power plant;
- **"Dolina Słupi" (Słupia River)** special protection area - in a minimum distance of approx. 15 km towards south from the nearest planned location of wind power plant;
- **"Przybrzeżne Wody Bałtyku" (Coastal Baltic Sea Waters)** special protection area - in a minimum distance of approx. 18.5 km towards north from the nearest planned location of wind power plant;

- **Sites of Community Importance:**

- **"Dolina Łupawy" (Łupawa Valley)** - in a minimum distance of approx. 3 km towards east from the nearest planned location of wind power plant;
- **"Ostoja Słowińska" (Słowińska Important Bird Area)** - in a minimum distance of approx. 12.5 km towards north from the nearest planned location of wind power plant;
- **„Klify Poddębskie" (Poddębskie Cliffs)**- in a minimum distance of approx. 18 km towards north east from the nearest planned location of the wind power plant
- **"Bagna Izbickie"** - in a minimum distance of approx. 18 km towards north west from the nearest planned location of wind power plant
- **"Torfowisko Pobłockie"** - in a minimum distance of approx. 18.7 km towards west from the nearest planned location of wind power plant.

- **nature monuments** - the nearest ones, within the geodetic precinct of Karżniczka, in a minimum distance of 1.6 km towards south from the nearest planned location of the wind power plant.

5. DESCRIPTION OF MONUMENTS PROTECTED UNDER THE REGULATIONS ON MONUMENT PROTECTION AND CARE AND ON THE PROTECTION OF THE OTHER CULTURAL HERITAGE IN THE LOCATION OF THE INVESTMENT

Within the location of the "Bięcino", there area no facilities listed to the register of monuments on the basis of the provisions on the protection and care of historic monuments.
The nearest of the historical monuments is situated in a distance of approx. 750 m (house with arcade in Bięcino dated back to 19th century).
In addition, pursuant to the "Study..." (2010), there are 177 archaeological and conservatory protection zones recorded in the commune area, in a rank of large settlements of permanent and stable form and (in vast majority) small settlements and hutments of non-permanent and seasonal development.
The "Bięcino" wind farm is located partially (power plants 1-4 - see cartographic appendix) within the limited and partial archaeological conservatory protection.
All earthworks related to implementation of the investment within these zones require prior agreement with the Voivodeship Conservator of Monuments.

6. ENVIRONMENTAL IMPACT ASSESSMENT OF THE INVESTMENT SCENARIO

AND JUSTIFICATION OF THE SELECTION OF THE SCENARIO FOR IMPLEMENTATION PROPOSED BY THE APPLICANT

The following investment scenarios were analysed:

- **baseline scenario** - 13 wind power plants of maximum sound power (loudness) up to 105 dB;
- **alternative scenario no. 1** - 13 wind power plants of maximum sound power (loudness) up to 107 dB;
- **alternative scenario no. 2** - 18 wind power plants.

The comparative environmental impact assessment of the investment scenario are presented in:

- acoustic analyses of the baseline and alternative scenario no. 1 (chapter 6.2);
- tables 13 a-c containing comprehensive assessment of the baseline and alternative scenario no. 2 (chapter 6.3.).

In effect of the assessment of these scenarios, the baseline scenario of 13 wind power plants of maximum sound power of 105 dB was selected the most environmentally advantageous. This scenario was selected for implementation and detailed environmental impact assessment (see chapter 7 of the "Report..."), leading to determination of the activities aiming at prevention or mitigation of adverse environmental impact and environmental compensation (see chapter 10 of the "Report...").

7. ENVIRONMENTAL IMPACT ASSESSMENT OF THE INVESTMENT SCENARIO SELECTED FOR IMPLEMENTATION

Construction stage

Impact of the planned power plants and associated infrastructure on abiotic environment will take place primarily at the investment stage lasting usually several months. This will result in significant surface transformations (land levelling for the new roads and locations of the power plants), vegetation will be liquidated (primarily agrocenoses and wasteland vegetation) and large volumes of waste will be produced (excavation debris).

Vegetation will be liquidated also when performing the MV cable connections along with the optic fibre line. This will apply mostly to agrocenoses, wasteland vegetation and ruderal vegetation along the roads. Throughout the entire route of the MV cable line and optic fibre line, trees protection outside the technical belt of the roads is planned.

Implementation of the planned investment is located outside the watercourses and water bodies and shall have no impact on surface and groundwaters.

Potential environmental nuisance will be related to vehicle traffic in terms of earthworks, transport of output and construction elements of the power plants. According to the performed analysis, calculations of all transport pollutants emitted at the construction stage from the area of the designed wind farm will be of trace nature (negligible).

Investment exploitation stage

Operation of the "Bięcino" wind farm will have negligible impact on water conditions and local climate conditions

According to the conclusions to the ornithological monitoring (Antczak 2010 – **Appendix 6**): (...)it can be stated that the planned investment, subject to meeting of the specific recommendations, shall constitute no extraordinary risk both to local group of breeding birds and migrating birds.

Pursuant to the conclusions to the chiropterological monitoring (Kościów 2010-

Appendix 7) (...) *it is assumed that the location of the investment will not contribute significantly to increased mortality of bats present primarily in the synurban areas, Bięcino locality and areas of Mrówczyn and Dębniczka. The planned location of the wind farm poses also no ecological barrier since no flights of bats over the fields at which the wind turbines are designed were stated.*

For the planned "Bięcino" wind farm, the acoustic analysis of the power plants operation was performed. According to the computations made, implementation of the analysed investment in its planned form is possible. The planned wind farm can operate with no limitations at full loudness of each turbine (105 dB) during the day. At night, also all wind power plants can operate, however part of them with limited noise emission to the environment. In the case of using the wind power plants of lower sound power, the need to reduce the settings of these power plants can be modified or become unnecessary.

The planned investment, including operation of the wind power plants will pose no risk to humans in terms of infrasound emission.

The planned investment will not act as a source of excessive emission of electromagnetic radiation.

According to landscape analysis, the planned complex of 13 wind power plants "Bięcino" will be a new specific element of landscape transformation in the Damnica commune: Its landscape exposure will take place from the villages located in the surroundings of the investment area, primarily from the localities situated nearby, i.e. Bięcino, Karżniczka, Budy, Dębniczka and in a distance of approx. 1.9 km from the Damnica commune village. The transport routes in the area of the location of the investment include railway line No. 202 Gdansk - Stargard Szczeciński and national road No. 6 as well as local roads of hardened surface (in a distance from several hundred meters) and the remaining unpaved roads, crossing the area of the location and its surroundings.

Visibility of the planned wind power plants from the nature conservation forms will take place primarily from the edges of the Natura 2000 site of Community importance "Dolina Łupawy" (Łupawa River Valley) situated approx. 3 km towards east from the location of the "Bięcino" wind farm;

Due to forest complexes located in far surroundings of the "Bięcino" wind farm, the power plants will be visible only from the north-western part of the "Dolina Słupi" (Słupia River Valley) Landscape part (from the vicinities of the Krępa village).

Due to forest complexes in the vicinity of the "Bięcino" wind farm, wind power plants will not be visible from the Pas Pobrzeża na Wschód od Ustki (Coastline towards East from Ustka) Landscape Protected Area

In many of the above cases, visibility of the planned wind power plants will be limit or even eliminate road tree lanes, small forest patches, tree stands, bushes and construction facilities.

Location of the wind farm planned for exploitation for 25-30 years (periodic landscape impact within the agricultural areas, shall contribute to protection of landscape against introduction of permanent settlement type devaluating the investments);

Decommissioning of wind farm shall cause restoration of landscape to the initial state (provided that the agricultural use will be continued).

Tangible assets at the area of the location of the planned investment are represented by the network of poviat and commune roads, private roads (mostly unpaved), elements of technical infrastructure, and in the surroundings by rural development of diversified architectural nature and technical condition. In the period of the "Bięcino" construction, reconstruction and modernisation of part of commune roads and other local ground roads and construction of the new assembly roads will be necessary. This will improve the condition of road network within the location of the wind farm and

its surroundings and contribute to the improved living conditions of the local community.
Apart from road infrastructure, the power plant construction shall have no impact on any other tangible assets. The construction of the "Bięcino" shall in particular results in no adverse impact on investment of the villages.
Impact on tangible assets at the exploitation stage will refer to the scope of land use in the scope of excessive impact of wind farm on acoustic climate. The area of the power plants and their excessive noise impact is and will remain in agricultural use. The owners of these area will be unable to change the land use from agricultural to development lands associated with permanent stay of people (settlements, single family houses, etc.), which is included in the **"Local Spatial Development Plan in the Damnica Commune within the Bięcino and Karżniczka precincts".**
Operation of the power plants shall not affect agricultural activity, with regard to which the lands as arable lands will not lose its value.
Investment decommissioning stage
At the decommissioning stage of the planned investment, the following environmental impact is projected:

- temporary emission of pollution to atmosphere and noise emission (vehicles and demolition machinery),
- construction material waste production (debris, scrap, etc.);
- production of other waste, including hazardous waste (e.g. consumed oils and greases);
- restoration of landscape to the pre-investment stage.

8. INVESTMENT IMPACT ASSESSMENT ON LEGAL FORMS OF NATURE CONSERVATION AND LANDSCAPE PROTECTION

Construction and exploitation of the "Bięcino" wind farm shall cause no risk to the protected flora species (location at the agricultural areas) and fauna species, excluding potential risk to flying animals. According to the environmental monitoring, risk both for bats and birds is low. Impact on the protected species cannot be excluded, although of individual nature and posing no risk to the population.
Due to the distance (approx. 12.5 km and approx. 7.5 km from the buffer zone) and forest complexes surrounding the Słowiński National Park, the planned "Bięcino" wind farm will not be visible from the Park. In addition, due to the distance and nature of the power plant nature, no impacts on habitats and flora and fauna species protected within the Słowiński National Park will take place.
Due to minimum distance of 12.5 km, the subject-matter of protection in the nature reserve (juniper complexes) and location of the reserve within the forest complexes (no exposure of the power plants), implementation of the planned "Bięcino" wind farm and MV cable line with optic fibre shall cause no negative impact on the natural values of the nearest nature reserve "Jałowce".
In addition, the impact of the planned investment on the nature reserves existing in a greater distance from the location of the investment i.e. **„Bagna Izbickie"** and **„Torfowisko Pobłockie"** due to forest type of the nature reserves and distance (17 km and more from the nearest wind power plant) will not occur.
Exploitation of the investment shall pose no risk of devaluation of the protected values of the "Dolina Słupi" Landscape Park (in a minimum distance of approx. 14.8 km from the nearest power plant towards south. Due to the distance and presence of natural obstacles (tree stands, forest complexes, rural settlement and inclines), wind power plants and associated infrastructure will not be visible from the Park area. The wind farm will be also located outside the Park buffer zone (in a distance of more than 6 km

from its border) established for its protection against the external risks.
Exploitation of the "Bięcino" wind farm will cause no risk for the protected values of the protected landscape areas and to their functions as ecological corridors.
The planned wind power plants will be located in a minimum distance of approx. 14.2 km from the border of the PLA "Pas Pobrzeża na Wschód od Ustki" (Coastline towards East from Ustka). Due to forest complexes in the vicinity of the "Bięcino" wind farm and topography, the planned wind power plants can be visible from this area. Due to the distance (more than 20 km) and covering by the topography and forest complexes, the wind power plants will not be visible from the remaining protected landscape areas.
No impact of the planned wind power plants on the other nature reserves in the regional surroundings will take place, for the most due to large distances from the location of the investment (more than 17 km). Also the construction and exploitation of the MV power cable and optic fibre line will not affect the objectives of nature conservation in the reserves.
Pobrzeże Słowińskie" (Słowińskie Coastal Region) **special protection area - in a minimum distance of approx. 12.5 km towards north from the nearest planned location of wind power plant;**
The nearest area of Community importance **Dolina Łupawy"** (Łupawa River Valley) is located in a minimum distance of approx. 3 km towards north from the nearest planned power plant.
According to chapter 7.2.12 of this "Report", the planned "Bięcino: wind farm shall cause no significant impact on the Natura 2000 sites, including in particular:

- shall not deteriorate of the condition of natural habitats or habitats of flora and fauna species, for the protection of which the Natura 2000 sites were established or
- shall have no negative impact on the species, for the protection of which the Natura 2000 sites were established or
- shall not deteriorate the integrity of the Natura 2000 sites and its associations with the other areas.

Operation of the "Bięcino" wind farm with associated infrastructure shall have no impact on the nature monuments in the surroundings of the investment. The nearest ones are located within the geodetic precinct of Karżniczka, in a minimum distance of 1.6 km towards south from the nearest planned location of the wind power plant (see chapter 4.1.).
The nearest ecological sites are located approx. 9 km towards east from the investment area and include mainly the sites around the Dąbrówka Lake protecting the bog coniferous forests and minor water reservoirs and wetlands.
Operation of the "Bięcino" wind farm shall cause no negative impact on distant ecological sites

9. DIAGNOSIS OF THE POTENTIALLY SIGNIFICANT ENVIRONMENTAL IMPACTS OF THE PLANNED INVESTMENT, INCLUDING TRANS-BORDER IMPACTS AND DESCRIPTION OF THE APPLIED PROJECTION METHODS

At the construction stage of the planned investment, the following environmental impacts will occur: lithospheric surface layer transformation (excavations), liquidation of soil cover and of vegetation, impact on fauna, emission of pollution to atmosphere (vehicles and construction machinery), noise emission (vehicles and construction machinery) and waste production (primarily excavation soil). These will be insignificant and short-term impacts.
At the exploitation stage of the planned investment, the potentially significant environmental impacts will include: reduction of pollution emission to atmosphere from

the conventional energy sources, noise emission by the power plants and landscape anthropization (primarily direct and long-term impact). The remaining impacts include: very low emission of ultrasounds by the power plants, negligible emission of electromagnetic radiation at the level not exceeding the permissible standards in publicly available sites, low optical effects (negligible stroboscopic and low shadow flickering effect) and the potential individual impact on subjectively assessed environmental conditions of qualify of life of humans (cumulative impact effect). No negative impact on human health will take place.

At the decommissioning stage of the planned investment, the potentially significant environmental impacts will cover production of construction material waste (direct, short-term and periodic). The remaining environmental effect include emission of pollution to atmosphere and noise emission (vehicles and demolition machinery). The landscape will be restored to the pre-investment stage.

The planned "Bięcino" wind farm with technical infrastructure will require no establishment of limited use area and is also not included into the plants of increased risks or high risk of severe industrial failures.

The "Bięcino" wind farm, due to the scale of investment and location in a distance of more than 20 km + 12 sea miles from the maritime border of Poland, shall cause no trans-border environmental impact.

There are already other wind farms operating in the surroundings of the "Bięcino" wind farm. In addition, planning procedures aiming at location of the other wind farms are under way. The most important cumulative effect of environmental impact of planned wind farms will be their impact on landscape.

Wind power plants included in the nearest complex in the Słupsk commune, due to insignificant distance of approx. 1 km and no important landscape obscureness, will be mostly visible at the same time. In addition, cumulative impact in the scope of noise emission is possible. At present (October 2012) location of the wind farm at this area and their total number remains unknown. Possibility of analysis of cumulative impact in the scope of noise emission with the "Bięcino" wind farm is therefore excluded.

Impact on fauna, in particular avifauna, can cover reduced attractiveness of the location of wind farm as feeding sites and obstacles in bird migration in local scale. Due to the size of the areas covered by the planned wind farms and distances between them, this risk is currently excluded. No multiplication of the barrier effect will take place.

Due to distances from the other wind power plants and their complexes, accumulation of noise impact of "Bięcino" is excluded.

10. PROPOSED ACTIONS AIMING AT PREVENTION OR MITIGATION OF ADVERSE ENVIRONMENTAL IMPACT AND ENVIRONMENTAL COMPENSATION

Mitigating of the environmental impact of the planned "Bięcino" farm can be obtained by applying environmental-friendly technology of construction works (including limitation of the investment works in time), selection of technical parameters of the planned wind farms limiting their environmental impact and forming of natural environment of the location and its surroundings.

Detailed solutions are presented in chapter 10.

11. ANALYSIS OF POSSIBLE SOCIAL CONFLICTS ASSOCIATED WITH THE PLANNED INVESTMENT AND CURRENT SOCIAL CONSULTATIONS UNDER THE PROJECT

With regard to the planned "Bięcino" farm, the following social conflict may arise:

- protest of ecologists and so called pseudo-ecologists[17] against the location of wind farm near the nature and landscape protection forms,
- protests of inhabitants of the surrounding villages, from among of whose some people may protest in fear of deterioration of their living conditions, including against:

– excessive noise, infrasounds and electromagnetic radiation;
– deterioration of landscape values of the surrounding areas and optic effects.

These social conflicts could be of discussion or subjective nature (landscape impact) or would be deprived of content-related, legal and formal bases (impact on noise, nature conservation forms and land real-properties). Any potential protests will be strongly emotional with economic prerequisites.
Within the proceeding on environmental impact assessment on the planned investment related to issuing of the decision on environmental conditions and consent for implementation of the investment, ensuring social participation in compliance with the provisions in force is required.

12. PROPOSED MONITORING OF ENVIRONMENTAL IMPACT OF THE PLANNED INVESTMENT

The planned "Bięcino" wind farm, upon its putting into exploitation, will require monitoring in the scope of noise level measurement in the environment and control of the potential impact on behaviours and mortality of bats and birds.

13. LIST OF DIFFICULTIES RESULTING FROM TECHNOLOGICAL OR KNOWLEDGE GAPS AND IDENTIFIED AT THE REPORT PREPARATION STAGE

When preparing the "Report on environmental impact of the "Bięcino" Wind Farm and associated elements (Damnica commune, Słupsk poviat, Pomeranian voivodeship") no difficulties resulting from technical or knowledge gaps, excluding lack of knowledge on avifauna, fauna of bats and of the other terrestrial mammals, amphibians, reptiles, vegetation and natural habitats, were stated. In order to fill these gaps, the environmental monitoring was performed.

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[17] Ecologist is the representative of biological science discipline, subject-matter of which are the studies of interrelations and associations between the organisms or their populations and their environments. Pseudo-ecologist is a representative of any other profession, preaching (from different reasons) and in rare cases implementing the pro-ecological beliefs.