

## Chapter 6

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# NATURA 2000 Site Designation

### 1. Introduction

The European network of nature protection sites NATURA 2000 has been established by adopting the legislation concerning the protection of natural habitats and wild flora and fauna (Directive 92/43/EEC, of the 21<sup>st</sup> of May 1992, on the conservation of natural habitats and wild flora and fauna, commonly referred to as the Habitats Directive). Environmental protection is also the subject of regulations set forth in several international agreements entered into by the European Union. *It means that such regulations have to be adopted by countries accessing the EU, together with the rest of EU legislation* (Raszka, 2003). This refers to the Convention on biological diversity of 1992 and the Convention on the conservation of European wild flora and fauna species and their natural habitats of 1979.

Both the above mentioned conventions have been ratified by Poland. The directives specified hereabove determine the principles for the creation of a coherent system of protected areas, called European Ecological Network Natura 2000 and they oblige the EU member states to take actions towards the protection of these areas. Ways, methods and criteria of designation of sites included in the network have been set forth in the Habitats Directive. Natura 2000 Network also comprises the areas designated pursuant to the Birds Directive. In order to protect the habitats a special conservation area (SOO) has been designated, in which the required protective means are applied in order to preserve natural habitats. special areas called OSO have also been established to protect birds' nests. *The procedure of establishing SOO and OSO areas consists of the following steps: preparation of the list of local “Natura 2000” sites by the Member State, evaluation of the list by European Commission, compilation of the list of areas of importance for the community and finally a formal designation of the accepted protection areas by the Member States* (Gotlib et al. 2007).

In comparison to the systems operating in other EU countries, Polish system of environmental protection is very well developed. Pursuant to the Act on Environmental Protection, the subjects of conservation are: national parks, nature

reserves, landscape parks, protected landscape areas, natural monuments, documentation sites, ecological grounds, landscape-nature protected complexes, plant and animal species protection, and after the amendments introduced in 2008, also Natura 2000 sites. The national concept of nature conservation system differs from the one adopted by EU both in the aspect of existing legal regulations and in organizational and financial arrangements. The process of creating Natura 2000 Network in Poland was preceded by a survey of existing and planned conservation areas from the point of view of the criteria specified in the Habitats Directive and Birds Directive. Moreover, some areas have been identified which are currently not protected by any form of nature conservation, but are eligible for protection within the network. The status of a Natura 2000 site may exist simultaneously with other forms of nature preservation. It means that a certain area may have a “double” status.

As a result of the inclusion of these areas into the network they have obtained an international status and an obligation was imposed to efficiently protect and monitor the state of nature. moreover, Art.33, item 1 of the existing Act on Environmental Protection states that: *it is forbidden to undertake any action which can significantly contribute to the deterioration of the state of natural habitats and plant and animal species habitats and which may have a substantial negative influence on the species protected by means of designation of Natura 2000 sites.*

So far, Polish government has proclaimed, by resolution, 124 areas of special protection of birds and it has applied to the European Commission for the acceptance of further 364 proposed areas of special habitats protection. On November 13<sup>th</sup>, 2007, the European Commission issued a decision accepting the list of 172 Natura 2000 sites in the continental region. A similar decision has been issued on January 25<sup>th</sup>, 2008, for 17 Natura 2000 sites in the Alps Region.

One of the steps during the development of implementation of the Natura 2000 project was the creation of a spatial database of the sites covered by the directive. The database has been prepared with use of GIS technology. The borders of proposed Natura 2000 sites have been presented on a topographic map – in the scale of 1:100 000. Together with the implementation of EU directives in Poland, a computer system has also been created that enables to take inventory of the sites included in Natura 2000 network. This system uses GIS tools and enables its users to identify the location of specific habitats. Moreover, an internet portal for European Natura 2000 Network has been established.

In Poland, borders of Natura 2000 sites were elaborated in detail in 2006. *For the purposes of the realization of the geographic and IT project GIS technologies and satellite photographs archive from years 2004-2005 were used, together with vector data collected from forest inspectorates, protected areas and the National Borders Register* (Gotlib et al. 2007). Spatial data for the nature conservation areas are being supplied continuously.

The problem with the determination of borders in the subject areas is connected with activities undertaken on the local level, including planned economic activity. “Planning – location instruments are essential tools determining the shape of space

filled with anthropogenic objects” (Kistowski 2003, Hełdak 2009). A very promising trend of development in environmental engineering and protection is the development of new, more sensitive methods of early detection of potential threats for biodiversity, proper functioning of ecosystems and the health of present and future generations (Dobrowolski 2008).

The aim of this study is to discuss the problem of the specification of Natura 2000 borders, illustrated by the example of procedure conducted for the area situated in Żelazno village in Kłodzko Commune. In the subject area an attempt has been undertaken to resume the exploitation of “Żelazno I” marble deposit. The quarry is situated within the suggested Natura 2000 site – “Pasma Krowiarki” (Krowiarki Range) and permission has been granted for the exploitation thereof.

## **2. Materials and methods**

Work on the delineation of the border of Natura 2000 site were conducted under the supervision of a specialist in biology and plant ecology. In order to specify the border, the measurements were taken basing on warp points, with the use of GIS system in ASG-VRS technology, where KŁODZKO reference station served as base point.

Geographical Information System, also called, however the method and convention, Spatial Information System, or Area Information System, or Geo-information System, The system enables not only gathering but also analyzing geographical data (the data related to geographical space) and descriptive attributes assigned to them. The system allows registering the spatial data in logical structure, their versatile analysis and visualization. It is also used to describe, explain and foresee the spatial distribution of geographic phenomena. GIS system, most of all, consist of proper software and hardware, collected data, applied algorithms and the procedures of information processing and making it available (Gotlib et al. 2007).

The measurements were taken with use of a GPS system receiver with ASG-VRS measurement module – R8 type. Then, calculations were made in a computer technique compatible with c-geo programme.

As a result of the conducted procedures border points of the range of exploitation field have been numbered from 1-28 leaving a 10 m wide destruction free zone alongside the borders of natural habitats Natura 2000. Next, the borders were marked in an unambiguous and permanent manner.

## **3. Natural values of the area**

The analysed area is located in village Żelazno, commune Kłodzko, district Kłodzko, within the borders of potential Natura 2000 site “Pasma Krowiarki” (Krowiarki Range) – code PLH020019 Krowiarki Range, wildlife refuge type E (SOO – bordering with another Natura 2000 site – OSO or SOO, but the sites do not overlap), an area the size of 5423.188 hectares. Krowiarki is a small mountain range within the Śnieżnik Massif. Dismembered, small hills are composed

of metamorphic limestone, appearing in a shape of natural outcrops and exposures in numerous quarries. Natural forests, fertile and rich in flora, are now divided into small complexes, separated by fields and meadows. Forests dominate in the terrain but fields and meadows also cover a large part of the area. The rest of the area consists of: active quarries, former arable fields on different stages of regeneration and other anthropogenic habitats. Until now the site has not been protected, excluding a small fragment which is a part of Śnieżnik Landscape Park opened in 1981 (Fig. 1).

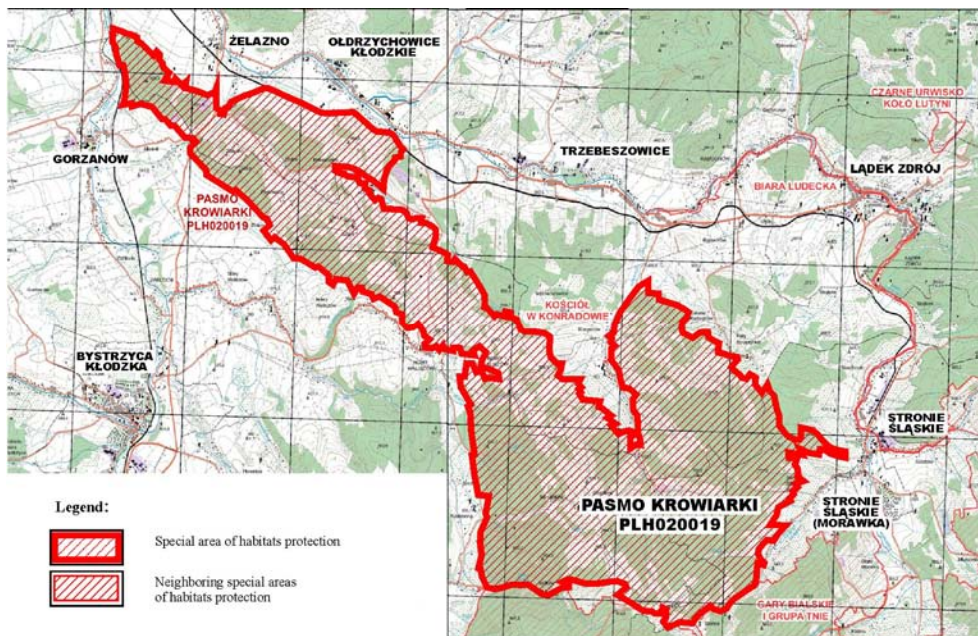


Fig. 1. Natura 2000 Site. Habitats Directive. PLH020019 Krowiarki Range  
Source: The author's own elaboration on the basis

Within the analysed area, designed for exploitation, deposits of marble are located. Permission has been granted for the exploitation of the terrain that evaluates the scale of annual output at about 150,000 m<sup>3</sup> of marble within the period of 15-20 years. The total exploitation area for which the permission has been issued equals 245,171 m<sup>2</sup>.

In the vicinity of the planned project natural habitats are located that are protected as a Natura 2000 Site "Pasma Krowiarki" (Krowiarki Range), including: *Asperulo-Fagetum* Sudetian beech forests (code 9130), Sudetian "orchidaceous" limestone beech forests thermophilous beechwoods (code 9150), and semi-natural dry grasslands and scrubland facies on calcareous substrates (code 6210\* - priority habitat). The range of the protected types of natural habitats constituting the basis for the creation of special areas of protection (SOO) of Natura 2000 Network in the region of potential deposit exploitation has been presented on Fig. 2. Moreover, the surroundings of the planned project contain stations of plant and bird species

protected by existing regulations of Polish law, issued by the Ministry of Environment.

The populations of the species subject to strict protection include stations of *Anemone hepatica* (*Hepatica nobilis*), *Daphne mezereum* (*Daphne mezereus*), Broad-leaved Helleborine (*Epipactis helleborine*), European Common Twayblade (*Listera ovata*), and the species liable to partial protection: Ivy (*Hedera helix*), Cranberrybush (*Viburnum opulus*), Lily of the Valley (*Convallaria majalis*), European wild ginger (*Asarum europaeum*), Woodruff (*Asperula adorata*), Primula (*Primula elatior*).

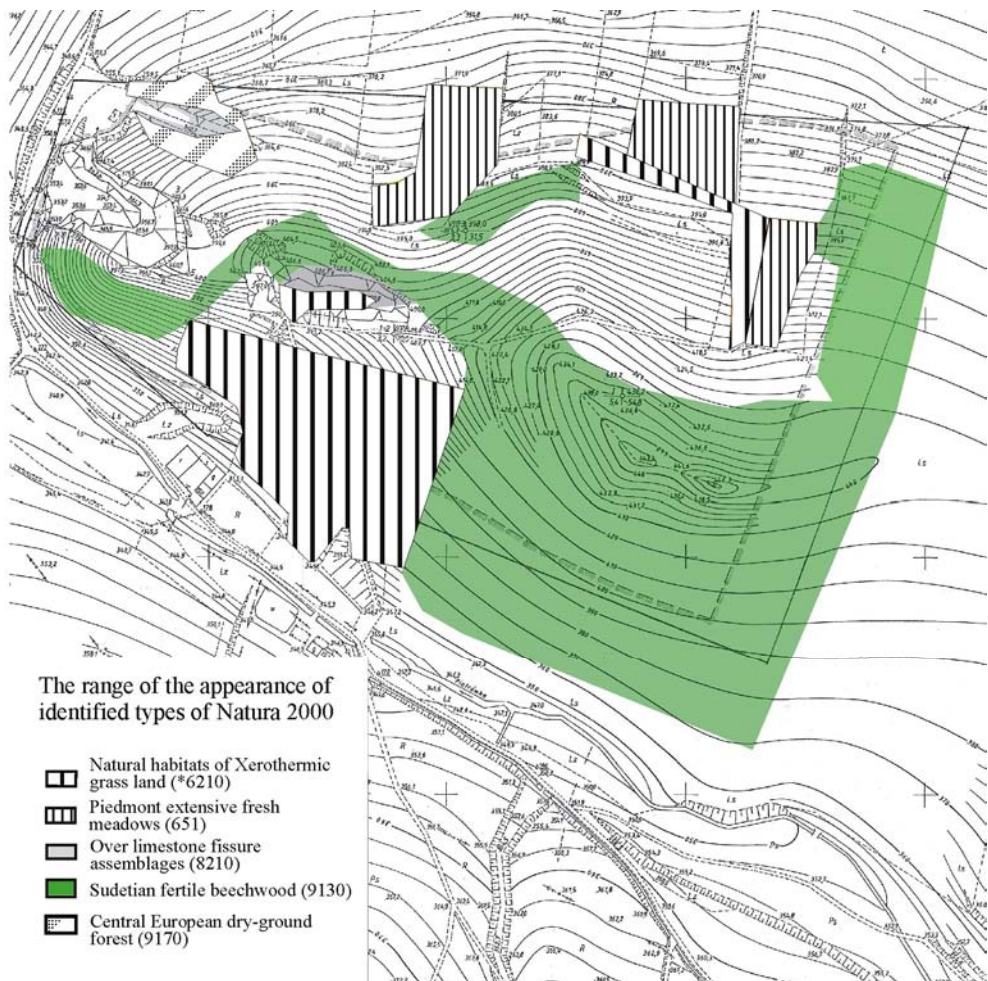


Fig. 2. The map of protected types of natural habitats which are basic for establishing special areas of protection (SOO) of Natura 2000 Network in the region of potential deposit exploitation

#### **4. Characteristics of current and planned exploitation of the deposit**

The terrain designed by the investor for the planned project encompasses the central and northern parts of the mining area „Żelazno II”, where deposits of marble are located. The deposit has the form of two lenses covering the northern and central part of a hill of the height of 446.3 m. Southern slopes, located outside the deposit of exploitable resources, will not be subject to excavation and thus their landscape and natural values will be preserved. The investor has been granted permission for exploitation.

The quarry had been exploited earlier, until 1976 when exploitation was discontinued. As a result, a two-level excavation was formed in the shape of a niche surrounded by high rock walls. Earlier remains of marble exploitation (from the 20<sup>th</sup> and 19<sup>th</sup> centuries), overgrown by a thick plant cover, are visible both to the northwest of the quarry (in form of a narrow excavation and mounds overgrown by a young dry ground forest), on the ridge of the hill to the east (in form of a relatively deep excavation cutting into the southern slopes of the hill) and to the south of the quarry, at the foot of the hill. In 2006 exploitation was resumed, expanding the excavation to a new area of the ground approx. 25-30 m to the eastern direction, and starting the exploitation of resources located on lower excavation levels. Currently the exploitation has been discontinued, due to administrative proceedings related to the obtaining of the required decision on the environmental conditions of the project.

The investor intends to resume superficial exploitation of minerals – in this case, marble – on a maximum scale, however meeting the requirement not to significantly deteriorate the state of natural habitats and habitats of plant and animal species, and not to impact negatively those species, for which the Natura 2000 site „Pasma Krowiarki” (Krowiarki Range) (code PLH020019) was established:

The foreseen annual output will reach approximately 150 000 m<sup>3</sup> during the exploitation period of 15-20 years. The total area of the terrain of the planned project equals 245 171 m<sup>2</sup>.

#### **5. Evaluation of the impact of the planned project**

##### **5.1. Natural environment**

The investor has been obliged to prepare a report on the influence of the project on the environment. The report proposes 3 possible versions of exploitation of the deposit. Depending on the selected version, the environmental aspects of the impact of the planned project on natural environment will be varied. These versions, presented below, are based on different ways of continuation of the investment, and thus also different extents of interference with the natural environment.



### 5.1.1. Version 1

This version foresees the expansion of the quarry Żelazno I within the mining area „Żelazno II”, according to the assumptions presented for evaluation by the initiator of the project and to requirements related to environmental protection.

This version presents a plan of realization of the planned projects, which specifies the maximum range of the future excavation field in relation to environmental protection regulations, so as to avoid a significant impact on the state of natural habitats and habitats of plant and animal species, as well as to avoid a significant negative impact on the species for which the Natura 2000 site „Pasma Krowiarki” (Krowiarki Range) was established.

According to this version, marble exploitation in the marble deposit „Żelazno I” in village Żelazno, commune Kłodzko, in Dolnośląskie voivodship will be continued. The quarry is located approximately 500 m to the east from the road Kłodzko – Bystrzyca Kłodzka, on the area of the proposed Natura 2000 site „Pasma Krowiarki” (Krowiarki Range), where the marble deposit „Żelazno I” is exploited.

In connection with the planned resumption of marble exploitation from the deposit „Żelazno I”, a series of actions aimed at exposing the deposit will be taken in the area where this mineral is excavated. Such actions include: a removal of the whole plant cover (cutting trees and bushes, devastation of herbal flora), removal of the soil cover together with a large amount of soil masses and rock waste. The economic exploitation of the mineral – marble - will start, leading to a further extension of the slope quarry, with the excavation depth reaching to approx. 50 m. Consequences of the exploitation of marble in quarry Żelazno will include:

- noise and vibrations resulting from blasting works reaching to approximately 200 m (a temporary, occasional factor, although of high intensity and range of the noise);
- scattering of rock shards, within a planned range of 200 m (a temporary, occasional factor, although of high intensity),
- dust emission during drilling works and during the loading and car transport of the raw material (the range of this factor should not exceed 100 m from the place of occurrence, but due to local changes in wind power and direction it may also influence areas located at a distance from the quarry), (intensity of the factor varies with time of day (during daytime) and depends on the applied technological process, although it is continuous, and of low intensity);
- noise created during drillings, cutting blocks, loading and car transport, (intensity of the factor varies with time of day (during daytime) and depends on the applied technological process, however it is rather continuous, and of low intensity);
- possible pollution of the area and of surface waters with petroleum-derived products (Diesel oil, lubricants) and other chemical substances created as waste in the technological process, or stored in the quarry (factor of a very

- low annual intensity, depending on the applied technological process, rather continuous, of low intensity);
- eutrophication and synanthropisation of the quarry and adjacent area; permanent factor, resulting from the intense presence and penetration alone, as well as from local activity of humans, who, through their activities and the devastation of plant cover, create such habitats that enable the appearance of species foreign to given types of habitats. This threat has a local range, in the discussed instance limited to the excavation itself and to those areas where the plant cover will have been removed;
  - direct devastation of habitats and habitats of species within the excavation field and in the zone alongside the border of the excavation, which will encompass fragments of layers of natural habitats of various degrees of preservation, (long-term, continuous factor of high intensity, permanently transforming the environment);
  - the consequences will be low and depending on the applied technological solutions (usage of energy efficient and material efficient solutions is in the interest of the investor).

In order to limit direct devastation of the natural environment to a minimum extent this version proposes to determine the range of appearance (distribution) of protected natural habitats and habitats of protected plant and animal species, basing on the results of a field mapping of natural habitats with use of a GPS receiver, which constituted the basis for the preparation of this study.

The analysis of the specific assumptions of version 1 leads to the following conclusions:

1. The planned project is located as a whole within the limits of the potential special protection site of the Natura 2000 network „Pasma Krowiarki” (Krowiarki Range) (PLH 010019).
2. The planned project is not related to the protection of the potential special protection site Natura 2000 „Pasma Krowiarki” (Krowiarki Range), nor does it result from such protection.
3. Large areas of natural habitats and numerous stations of species protected under the Natura 2000 network, as well as of other species of animals and plants that are rare or endangered in the country and in Lower Silesia, and of species under strict protection in Poland exist in the direct and indirect proximity of the planned project.
4. The realization of the evaluated version will or might cause the occurrence of a series of threatening factors influencing the situation of species and of natural habitats located in the vicinity of the planned project, including: factors active during construction: occupation of land necessary for the location of the planned quarry together with additional land occupied for exploitation purposes, intensive activity of people, cars and construction equipment on the construction stage in the area planned for marble exploitation, noise resulting from vehicle and construction equipment traffic



accompanying the construction, local environmental pollution connected with the on-going ground works, moving and storage of soil masses etc.

Factors actively influencing the environment in the exploitation phase include: vehicle and equipment traffic in the newly expanded excavation pit and its surroundings, noise and other forms of disturbance connected with the usage of explosive materials for exploitation together with the related works and machine activity, local environmental pollution and a change in the physical and chemical characteristics of natural habitats resulting from local emission of exhaust gas, dust, etc., potential threat of other types of environmental pollution resulting from accidents, breakdowns, etc., a gradual change in the manner of usage of areas adjacent to the new excavation pit.

5. The evaluation of the environmental consequences of the factors listed above in reference to the species and habitats specified in this study encompasses three types of influence:
  - I.** Devastation of natural habitats and destruction of stations of wild fauna and flora on the area occupied for the expansion of the excavation pit in the quarry.
  - II.** Deterioration of the state of natural habitats and of the conditions of the existence and/or reproduction of the flora and fauna connected with such habitats in the direct vicinity of the planned project (approximately up to 25 m from the edge of the planned excavation pit). This influence is caused by such factors, as: gradual changes in the physical and chemical characteristics of the adjacent habitats; gradual changes in the plant cover composition resulting from the introduction of species characteristic for synanthropic habitats, spreading along the edges of the new excavation pit and along the roads used for preparatory works; devastation of plants in the belt zone adjacent to the surrounding of the edge of the new excavation pit as a result of increased accessibility of the land and scattering of rocks during explosions; scaring and other forms of influencing the animal species populating the area surrounding the new excavation pit; gradual decrease of the population of animals inhabiting these areas (accidental deaths of specimens migrating in the vicinity of the new excavation pit); unintended devastation of natural habitats and of stations of wild fauna and flora resulting from the changes in land usage in the surroundings of the new excavation pit.
  - III.** Deterioration of the state of natural habitats and of the conditions for the existence and/or reproduction of wild fauna and flora connected thereto in the indirect surroundings of the planned project (from 25 to approx. 50 meters from the edge of the planned excavation pit), caused by factors including: the introduction of an environmental barrier across the migration paths of fauna; results of the fragmentation and isolation of parts of habitats that used to be connected, increasing in time (Pullin 2005); decreased usability or attractiveness of the areas located within the range of the acoustic and visual influence of the new excavation pit

as potential locations for breeding or preying of animals, especially mammals and birds; increased accessibility and penetration of the surroundings of the new excavation pit.

6. If the planned project is to be realized in version 1, then its negative influence will concern 6 types of natural habitats and over 20 species of plant and animal species under strict protection or endangered on national or regional scale, specified in this study, including:

- 6 types of natural habitats listed in Annex I to the Habitats Directive (of a total area of approx. 1.5 ha);
- 2 species of animals listed in Annex II and/or IV of the Habitats Directive (total of at least 2 stations);
- 6 species of animals and plants listed in the „Red Lists” of endangered species of fauna and flora in Poland (Głowaciński 2002, Mirek et al. 2006);
- 5 species of plants listed in the „Red list of plant species endangered in Lower Silesia” (Kącki et al. 2003);
- 3 species of animals and at least 6 species of plants subject to strict protection in Poland.

From the point of view of protecting the integrity of the potential Natura 2000 site „Pasma Krowiarki” (Krowiarki Range), the most important negative influences connected with the expansion of the quarry Żelazno I within the mining area „Żelazno II” are:

- the deterioration of the state of a small area (approx. 1.0 hectare) of forest habitats listed in Annex I to the Habitats Directive;
- the deterioration of the state of small area (approx. 0.5 hectare) of open meadow, greensward and rock habitats listed in Annex I to the habitats Directive together with rich fauna and flora populating these habitats (total of approximately 5 animal species and approximately 5 plant species from the group encompassed by this study);
- the disturbance in the functioning of ecological corridors inside the Natura 2000 network sites. The planned project is located in the course of the Krowiarki Range, mostly covered by forest, which enters into the centre of Kotlina Kłodzka. This area, although it is crossed by the adjacent national road No 33 and the railroad Kłodzko-Międzylesie, performs an essential function as an ecological corridor of high local and sub-regional importance (mainly for the animal migration paths along the ridge and slopes of the Słupiec Massif and the adjacent valley of Romanowski Potok with hills located to the south – towards Wapniarka), which makes the planned project a potential barrier hindering the functioning of these paths.
- extension of excavation pit walls, which, in some conditions, may lead to positive environmental consequences for protected species and rare animals.

7. The location of the planned project offers only a limited range of possibilities to minimise its negative impact through the application of effective **preventive measures**. It should be emphasized that available technological means, used in order to decrease the negative influence of investments connected with superficial exploitation of minerals, cannot prevent serious disturbances to the functioning of rich natural systems, such as have developed in the western part of the Stupiec Massif and its surroundings, as a result of the existing extensive forest, meadow and pastures management and the discontinuation of exploitation of mineral resources in some of the excavation pits. The expansion of the excavation field of the quarry Żelazno I will cause, first of all, an increase in the fragmentation and isolation of forest habitats and will introduce an additional area of approx. 300 m of a wholly new ecotonal zone between the edge of walls and the excavation pit and the adjacent forests. This may lead to the withdrawal of numerous species of animals and plants, as well as enable further deterioration, including of species and habitats considered as important for the European Community and protected in Natura 2000 sites. When so many valuable natural elements are accumulated as in the discussed case, the investor bears the costs of their effective protection and is obliged to decide about the economic viability of the whole enterprise alone, without a guarantee that the assumed environmental targets will be achieved at all. Some of the essential actions to be taken by the investor include: a strict limitation of the range of marble excavation to a zone located not less than 10 m from the borders of the natural habitats Natura 2000, measured and entered on the map constituting the Appendix to this study, and marked in the field.
8. The spatial scale of the foreseen influences and specific biological properties of the influenced species and natural habitats make it impossible to plan an environmental compensation that would be both viable and at the same time adequate to the extent of losses. Such compensation would have to ensure the recreation of population of endangered species that have stations in the area where marble exploitation is allowed. Unfortunately, the chances of success of the above mentioned actions are low, particularly in the case of those species, whose re-introduction is difficult or practically impossible (including orchidaceous and other). The only compensatory actions pursuant to the above mentioned Act would be steps taken by the investor in connection with the active protection of grasslands and scrublands on the northern slopes of the ridge of the Stupiec Massif, consisting in the removal of the coating and/or planted birches and pines, as well as taking up regular mowing and/or pasturing.
9. Considering the circumstances listed above, which make it impossible to achieve the targets connected with the planned project in a manner that would at the most slightly deteriorate the state of species and natural habitats protected in Natura 2000 network sites, the version of realization of the planned project discussed in this section (version 1) should be considered as acceptable from the point of view of protection of habitats and species

protected in Natura 2000 sites and of the need to maintain the coherence of the national network of Natura 2000 sites.

10. For both evaluated projects no threat of occurrence of cross-border influences was determined.

### 5.1.2. Version 2

This version envisages the expansion of quarry *Żelazno I* and exploitation of marble from the deposit located within mining area „*Żelazno II*”. Further excavation works will consist in superficial excavation of minerals and related transformations of land surface on the whole area situated within the limits specified in the excavation permission obtained by the investor. This version differs from the previous one only by the expansion of the excavation field to the whole area encompassed by the permission granted to the investor. Thus, if version 2 is realised, then the only differences will consist in the prolongation of the exploitation period and in a total devastation of natural habitats and of habitats of protected plant and animal species. The analysis of detailed assumptions has allowed us to formulate similar conclusions as for version 1, points 1-5 and point 10, with the following differences:

1. The negative influence of the planned project realized pursuant to version 2 will concern 6 types of natural habitats and at least 30 species of plants and animals that are under strict protection or endangered on a national or regional scale, including:
  - 6 types of natural habitats listed in Annex I to the Habitats Directive (of a total area of approx. 12.8 ha),
  - 5 species of animals and plants listed in Annex II and/or IV of the Habitats Directive (total of at least 7 stations).
2. From the point of view of maintaining the integrity of the potential Natura 2000 site „*Pasmo Krowiarki*” (*Krowiarki Range*), the most important negative influences connected with the expansion of the quarry *Żelazno I* within the mining area „*Żelazno II*” include:
  - devastation (influence category I) of a substantial area (approx. 6.0 hectares) of forest habitats listed in Annex I to the Habitats Directive: a mosaic of areas of Sudetian orchidaceous limestone beech forests (9150) with some Sudetian *Asperulo-Fagetum beech forests* (9130) and areas similar to the submontane form of *Galio-Carpinetum oak-hornbeam forests* (9170), together with a rich flora and fauna populating these areas, and in particular the liquidation of 2 stations of the lady slipper orchid (*Cypripedium calceolus*), and nesting habitats of 2 couples of stock doves (*Columba oenas*) and one couple of black woodpecker (*Dendrocopos martius*).
  - devastation (influence category I) of a large area (approx. 2.9 hectares) of open meadow, greensward and rock habitats listed in Annex I to the Habitats Directive: areas of Semi-natural dry grasslands and scrubland facies on calcareous substrates with important orchid sites (6210\*),

submontane forms of lowland hay meadows (6510) and areas of Calcareous rocky slopes with chasmophytic vegetation (8210), together with a rich fauna and flora populating these areas, in particular the devastation of the station of the sand lizard (*Lacerta agilis*).

- disturbance in the functioning of ecological paths within Natura 2000 network sites. The planned project is located in the course of the Krowiarki Range, mostly covered by forest, which enters into the centre of Kotlina Kłodzka. This area, although it is crossed by the adjacent national road N° 33 and the railroad Kłodzko-Międzylesie, performs an essential function as an ecological corridor of high local and sub-regional importance (mainly for the animal migration paths along the ridge and slopes of the Słupiec Massif and the adjacent valley of Romanowski Potok with hills located to the south – towards Wapniarka), which makes the planned project a potential barrier hindering the functioning of these paths. This creates a real threat to the internal cohesion of this part of the Natura 2000 site „Pasma Krowiarki” (Krowiarki Range), especially by increasing the extent of isolation of the Wapniarka Massif.
- 3. The location of the planned project does not offer any possibilities to minimise its negative influence by means of taking effective preventive measures.
- 4. The spatial scale of the foreseen influences and specific biological properties of the influenced species and natural habitats make it impossible to plan an environmental compensation that would be both viable, and at the same time adequate to the extent of losses.
- 5. Considering the circumstances listed above, which make it impossible to achieve the aims of the project without a significant deterioration of the state of protected species and habitats in the Natura 2000 network sites, the evaluated version of realisation of the planned project (version 2) should be considered unacceptable from the point of view of conservation of species and habitats protected in Natura 2000 network sites and of the need to maintain the integrity of the national network of Natura 2000 sites.

### **5.1.3. Version 3**

Cancellation of the realisation of planned projects and leaving the surroundings in the current state (so-called zero version). A zero version is considered such version that envisages a discontinuation of any further surface exploitation of minerals (marble) in quarry Żelazno (deposit „Żelazno I”) and leaving its surroundings in the current condition. Such action will not cause any predictable negative influences on Natura 2000 sites (including the potential special protection site SOO Natura 2000 „Pasma Krowiarki” (Krowiarki Range)).

## **5.2. Economic, social and cultural aspects of the planned exploitation**

The activity of the quarry entails the employment of approximately 30 people in a region with a high unemployment rate, and apart from that, it carries real

financial benefits for the local competent units of territorial self-government, resulting from the exploitation-related fees and taxes paid by the investor. One should also bear in mind the growing demand for mineral resources, resulting both from the high dynamics of the construction and chemical sectors and from the planned realisation of a series of structural projects throughout the country in the years 2007-2013. These are, without any doubt, positive consequences, which should be taken into account during the evaluation of the project. On the other hand, an actively functioning quarry makes it impossible, or at least difficult, to use the land surrounding the villages Żelazno and Piotrowice Dolne for agrotouristic, recreational and leisure-related purposes, which are factors of increasing importance for the potential and realistic directions of development of the rural regions of Kotlina Kłodzka. Excavation of mineral resources is an activity that evidently contradicts with the sustainable directions of local and regional development, by introducing a series of negative consequences, including: anthropogenic landscape distortion, noise and threats to biological diversity.

## **6. Counteraction against environmental threats**

As a result of the on-going proceedings concerning the start of exploitation of the deposit, exploitation pursuant to version 1 was deemed as acceptable from the point of view of the requirements related to conservation of species and natural habitats protected within Natura 2000 network site „Pasma Krowiarki” (Krowiarki Range), as this version was considered to cause only a slight deterioration of the state of the said natural elements. The realisation of version 1, envisaging a limited expansion of the quarry „Żelazno I”, enables to avoid the interference with areas containing proven natural habitats Natura 2000, and the changes will be of a temporary nature. This version foresees the determination and delineation of a maximum range of potential ground surface transformations connected with superficial excavation of minerals within the limits of the deposit, so as to avoid a substantial deterioration of the state of natural habitats and protected species.

However, some consequences of marble exploitation will include:

- noise and vibrations caused by blasting works,
- scattering of rock shards,
- the noise accompanying drilling, block cutting, loading and car traffic,
- possible pollution of the terrain and surficial waters by petroleum derivatives and other chemical substances constituting technological process waste,
- eutrophication and synthropisation of the quarry and adjacent terrain,
- direct devastation of habitats and species habitats within the range of excavation field, and in the belt zone alongside the edge of the excavation pit, which will encompass fragments of patches of natural habitats on different stages of preservation.

In order to mitigate the consequences of deposit exploitation, maximum range of extraction field has been determined, (including unambiguous and permanent marking in the field) leaving an at least 10 m wide destruction free zone alongside

the borders of natural habitats Natura 2000. In order to designate the border an essential map has been prepared (for designing purposes) – scale 1 : 1000. Then, basing on further geodetic measurements, under the supervision of a specialist in biology and plant ecology, the border has been charted in the field and put on the map (Fig. 3).

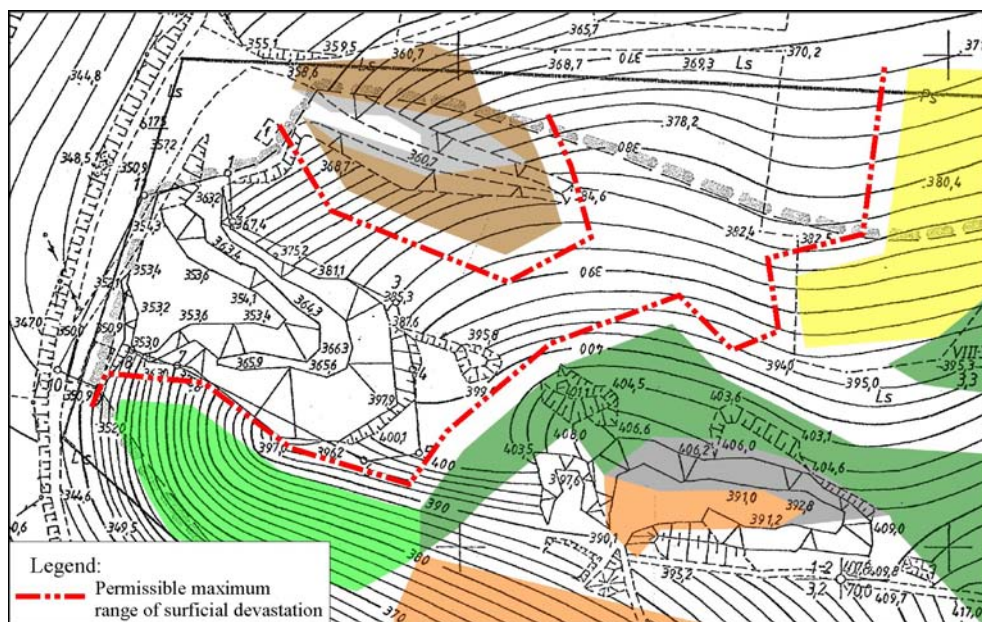


Fig. 3. The map of extraction field range

The border of maximum acceptable range of superficial devastation has been determined taking into account the appearance of protected types of natural habitats which constitute the basis for the creation of special conservation areas (SOO) of Natura 2000 Network. In order to enable the identification of the border in the field it has been marked by the ecologist and then permanently stabilized by measurement marks whose location has been geodetically evidenced. The course of the border has been measured and the coordinates have been assigned, according to national geodetic reference system, by a certified geodesist. The designated area of marble extraction does not, at any point, interfere directly with protected natural habitats. Geodetic measurement and stabilization have been conducted in the presence of the Investor. The points have been placed in a way that ensures that from each point two neighbouring points are visible.

However, as the exploitation of the deposit presents an indirect threat to the identified protected species, it was necessary to undertake a series of actions. In order to protect natural habitats in the period of August-September, it is planned to relocate the plants of legally protected species growing within the foreseen deposit exploitation area. The Investor is obliged to relocate at least 50 clusters of *Anemone hepatica* (*Hepatica nobilis*), at least 30 specimen of *Daphne mezereum*



(*Daphne mezereus*), at least 50 specimen of *Epipactis helleborine*, and *Listera ovata*. Moreover, an order has been issued, obliging the investor to introduce annual extensive pasturage (0.3 – 0.6 DJP per hectare) in the second half of July or to mow the grass and meadows located in the area beyond the excavation pit. These actions should be performed under the supervision of a specialist in biology and plant ecology.

Further restrictions concern, among others, the exclusion of at least one of the walls from exploitation during spring and summer, as well as the methods and periods of blasting and excavation works in the quarry.

In the destruction free zone, reaching at least 10 m from the range of the excavation field, and in the area of Natura 2000 site remaining within the limits of the investment, an obligation of constant monitoring has been imposed in order to examine the environmental influence of the undertaking during the construction and exploitation of the quarry. The monitoring should include the analysis of the current influence of the undertaking on Natura 2000 habitats and species, as well as on the species of plants and animals subject to protection, in particular those that populate the direct neighbourhood of the project. Species of animals and plants populating the direct vicinity include: *Charmentiera ornata*, Edible dormouse (*Glis glis*), Lesser horseshoe bat (*Rhinolophus hipposideros*), *Gentianella amarella* (*Gentianella amarella*), *Gentianella ciliata* (*Gentianella ciliata*), White Helleborine (*Cephalanthera damasonium*), *Anemone sylvestris* (*Anemone sylvestris*), Bird's-nest Orchid (*Neottia nidus-avis*), and the species relocated from the area of intended exploitation.

It is necessary to describe the arrangement and long-term dynamics of the population, to recognize potential and real dangers for these species and Natura 2000 habitats.

## 7. Conclusions

3. The determined maximum range of the excavation field with an at least 10 m wide destruction free zone located alongside the borders of natural habitats Natura 2000, results from the necessity to minimize the range of superficial devastation and to protect natural habitats located in close vicinity of the investment area.
4. Key spots should be marked in an unambiguous way and stabilized in the field, in the presence of potential Investor, in order to increase the efficiency of protection of Natura 2000 sites.
5. For the purposes of the procedure of application for the permission for aggregate exploitation, the principles of environmental protection have been established regarding both the regulations concerning habitats and species protection within Natura 2000 Site “Pasma Krowiarki” (Krowiarki Range), and existing Polish legal regulations concerning the preservation of protected plant species.

6. The works on the determination of the maximum range of excavation field have revealed that the determination of borders of protected areas requires the cooperation of biology and plant ecology experts as well as geodesists. Biology and plant ecology experts play a key role in the activities aimed at the determination of the border and marking the terrain. They bring in an invaluable contribution connected with the correct recognition of habitats and their further relocation to safe places and constant monitoring, including the analysis of current influence of the investment on Natura 2000 habitats and species as well as plants and animals subject to protection.

## References

- Council Directive 92/43/EEG from 21<sup>st</sup> May, 1992, concerning natural habitats and wild flora and fauna conservation.
- Council Directive 79/409/EEG from 2<sup>nd</sup> April 1979 concerning wild bird conservation.
- Dobrowolski J.W., 2008. Preface. Polish Journal of Environmental Studies, 17, 3A.
- Environmental Protection Bill from 16th April (Journal of Laws nr 92 from 2004, item 880 with changes).
- Głowaciński Z. (red.), 2002. Czerwona lista zwierząt ginących i zagrożonych w Polsce. Instytut Ochrony Przyrody PAN, Kraków, ss.155.
- Gotlib D., Iwaniak A., Olszewski R., 2007. GIS Application Areas (GIS Obszary zastosowań). Wydawnictwo Naukowe PWN, 246: 141-143.
- Hełdak M., 2009. Planning documents and sustainable development of a commune. Polish Journal of Environmental Studies. Vol. 18, No. 3A, p. 100-107 .
- Kącki Z., Dajdok Z., Szczęśniak E., 2003. Czerwona lista roślin naczyniowych Dolnego Śląska. W: Kącki Z. (red.). Zagrożone gatunki flory naczyniowej Dolnego Śląska. Instytut Biologii Roślin Uniwersytet Wrocławski, Polskie Towarzystwo Przyjaciół Przyrody „pro Natura”, Wrocław: 9-65.
- Kistowski M., 2003. Regional model of balanced development and environmental protection of Poland versus regional development strategies (Regionalny model zrównoważonego rozwoju i ochrony środowiska Polski a strategie rozwoju województw). Gdańsk University, Bogucki Wydawnictwo Naukowe, Gdańsk – Poznań, 392: 45.
- Mirek Z., Zarzycki K., Wojewoda W., Szelaż Z., 2006. Czerwona lista roślin i grzybów Polski. Instytut Botaniki im. W. Szafera, Kraków.
- Pullin A., 2005. Biologiczne podstawy ochrony przyrody. Wyd. Naukowe PWN, Warszawa, ss. 393.
- Raszka B., 2003. Warta River Gorge in Poznań and ecological systems planning (Poznański Przełom Warty w planowaniu systemów ekologicznych). Bogucki Wydawnictwo Naukowe. Poznań, 199: 48.

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