POST CLOSURE MONITORING OF ENVIRONMENTAL WORKS CONDUCTED IN VADU PASII AREA, BUZAU COUNTY

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Abstract
In terms of physico – geographical conditions Vadu Pasii area is located in the lower basin of the Buzau River, crossing the northern Buzau Plains. Morphologically, it is located in the minor riverbed of Buzau River and it is included in the Site of Community Importance ROSCI 0103 Lunca Buzaului. Ecological works were completed in 2009 and had, among many others, the purpose of protecting the wild flora and fauna of the Natura 2000 protected area Lunca Buzaului. According to the structure of the scientific work, in 2011 land works have been started off, along with a monitoring program, spread out over four seasons, designed with the purpose of monitoring and evaluating the conservation status of the species and habitats for which the Lunca Buzaului Natura 2000 site has been designated , together with other species and habitats installed here after the rehabilitation works came to an end. This paper is barely a part of a more ample research program focused on the impact of mining exploitations in the Vadu Pasii area, identifying pollution sources and studying the way revegetation works are being made in pasture's case, respectively the aquifer basin planning work.

Keywords*: sustainable development, exploitations works, ecological restoration, monitoring.*

INTRODUCTION

The best known definition of sustainable development is certainly the one given by the world commission on environment and development (WCED) in its report "Our common future", also known as the Brundtland Report (1987): "sustainable development is development that aims to satisfy present needs without compromising the ability of future generations to satisfy their own needs ".
Sustainable development aims and tries to find a stable theoretical framework for decision making in any situation concerning a man – environment report type, whether it is the natural environment, the economic environment or the social environment.
Thus, the goal of this study is to serve as "a solution to the ecological crisis caused by intense industrial exploitation of resources and continuous environmental degradation."
The main idea of this study suggests the following: mining activities are to be carried out as far as possible within strong anthropized areas (areas where mining objectives were abandoned without executing environmental remediation works, in areas where vegetation has been degraded by overgrazing, or areas where arboreal vegetation was grubbed etc.) and the achievement of efficient ecological restoration programs at the end of mining works, and also during their operation, consisting of certain flora species plantings in the area where the mine is located, which may become a suitable ecosystem for animal species to inhabit.
This material shows how a mining objective can be done (a gravel pit) in a strong anthropized area, and subsequent operational period, the way in which this mining objective is closed and transformed into a favourable ecosystem for wildlife species development, characteristic for areas protected by the European legislation, in this case the Site of Community Importance "ROSCI 0103 Lunca Buzaului".
During the first step, for the study to prove successful, it was necessary to analyze several types of gravel pits in order to identify that specific type of pit which best substantiates the basic ideas on which this study was built on.
Therefore, a mining objective has been identified (gravel pit) in a strong anthropized area, within a protected area. Taking into account that from the mining operations will result aquatic basins, it is possible, since the

actual work period, to create an ecosystem that can lay the foundation upon which various animal species, characteristic for the protected area above, to develop.
The holder of the mining objective analysed in this material is S.C. LAFARGE AGREGATE BETOANE S.A., which in the last two years has run an ample biodiversity monitoring program in cooperation with the University of Agronomic Sciences and Veterinary Medicine of Bucharest, students of it and consulting companies, outside of Vadu Pasii village, Buzau County.
It was found that the operator of the gravel pit carries on ecological works annually in areas where resources (sand and gravel) are exhausted, consisting of water basins slope geometrization, soil covering of emersed areas and sowing them, planting of reed curtains, namely arboreal species characteristic to protected area "ROSCI010 Lunca Buzaului".
The second stage of the study was represented by the monitoring program, conducted in order to observe and identify the species of migratory birds that arrived on the lakes resulted from mining operations, and other site-specific fauna species characteristic to the Site of Community Importance "ROSCI010 Lunca Buzaului".
The observation zone has a total area of approx. 100 ha, of which, at present, only 22 ha are affected by mining works, the remaining area being part of an active exploitation license. On the other hand, the monitoring work has been carried out in areas of the minor riverbed of the Buzau River, respectively on a distance of approx. 3 km downstream of the railway bridge Vadu Pasii.
In the Site of Community Importance "ROSCI010 Lunca Buzaului" are ongoing monitoring programs for flora and fauna species, a program initiated by the Ecological University of Bucharest (designated custodian of the site), with the aim of developing the site management plan.

MATERIALS AND METHODS

In the monitoring work there was initially consulted the existing bibliography, was made desk research consisting of analyzing information collected from documents (data on the last condition, current location) and consultation with local stakeholders. The information on the characteristics of ecosystems, landscape and environmental factors specific to the region and the characteristics of the local community were taken during field trips.
For population evaluation of the species were used both qualitative and quantitative methods.
For bird species was used their freely observation and optical instruments binoculars 10 x 50. The main goal of this method was to identify species on the surface and in the vicinity of the exploitation beaches.
The cartographic method consisted in identifying plant associations and territories of birds nesting in the area under study. The method uses estimated results in surface sampling to calculate density populations in larger areas or certain types of habitats of a region. In this study were used the counting techniques of the method.
For some species, "standard" methods of reviewing the nesting populations, and cartographic methods did not provide sufficient information. For this particular cases, it has been used a method that consists in direct bird counting, followed by noting on an observation sheet the species and the number of individuals identified.

RESULTS AND DISCUSSIONS

The physico-geographical characteristics of the area are: Relief. Vadu Pasii commune is located at the North West of Râmnic Plains, also occupying Buzau Valley with its terraces and meadows on the left, at the contact between the glacis and Râmnic Plains (Romanian Geography, 1972 -1979).
Underground resources. The commune's basement has natural gas and the Buzau River's and the Calnau River's bed offer aggregates - sand and gravel (Mutihac V., L. Ionesi 1974).
The vegetation is specific to the steppic region. On the slopes of the valleys and on parts of the meadow we meet the following species: Blackthorn, Dog Rose, Fescue, Couch Grass and Wormwood. The meadow vegetation includes grasslands that consist of different species of Graminaceae and clumps composed of Willow, Wicker, Alder and Poplar. Besides

these, in wetter places, we meet Sedge species, Bulrush and Reed. (Calinescu R. 1969).

The fauna. Animals are characteristic for steppes and silvosteppes, represented primarily by mammal rodents. Birds found in the area are: Quail, Partridge, Skylark. In Buzau River we meet endangered species of fish, due to irrational fishing and water pollution (Calinescu R. 1969).

The dominant soils in this area are medium leached chernozem. In Calnau and Buzau meadows are alluvial soils. (Ielenicz Michael, 2007)

Climate. The commune is part of the temperate - continental climate with influence of the Eurasian steppes. The average annual temperature is 10.6 º C, with annual rainfall of 522.8 mm. Summers and winters are relatively long and springs and autumns are short. In most of the summer humidity is negative. Absolute minimum was recorded in January 1942 (-29 º C) and the absolute maximum in august 1951 (39.6 º C). (Ielenicz Michael, 2007).

Data on objective recognition: Vadu Pasii exploitation perimeter is located in the extravillan of Vadu Pasii village, Buzau County, and in terms of physico – geographical conditions, the area is located on the lower course of the river Buzau, in a floodplain terrace on the left bank of the valley, crossing the Northern area of Buzau Plain. In this sector the minor riverbed has a width between 50 and 250 m, and in the major riverbed the river created meanders with large radius of curvature, which affects lower terrace banks. Absolute altitudes of minor riverbed are between 74.0 m and 75.0 m, and in the lower terrace of the left bank, between 78.0 and 82.0 m. In the left bank at approx. 600 m, is the upper terrace (inter-field), with altitudes of up to 105.0 m.

The operator is currently running mining works in a strong anthropized area. Most spontaneous vegetation in the area was severely degraded by overgrazing.

Since taking over the site, SC LAFARGE AGREGATE BETOANE S.A. conducted a series of environmental rehabilitation works on an area of 22 hectares, consisting of filling excavation, with irregular distribution, made in previous years. After this step, the surfaces were cover with soil horizon and then grassed and fertilized. This area received an agricultural use, respectively pasture.

In the water basins area were conducted works of slope geometrization, so they should be stable for a long term, planting reed curtains, to set up a habitat for the development of site-specific fauna species of "ROSCI010 Lunca Buzaului". These curtains also act to protect basin banks against erosion processes exerted by waves of 50 cm.

In order to achieve some habitat types characteristic for the area, and suitable for fauna development, the operator intends to perform ecological works, consisting of planting tree species such as: *Populus alba, Fraxinus excelsior, Salix alba, Alnus glutinosa*.

Monitoring of fauna and flora within the perimeter Vadu Pasii:

Monitoring works were conducted during four seasons in the gravel pit from Vadu Pasii in order to observe and identify migratory bird species in the lakes resulted from mining, and related areas of Buzau riverbed of away approx. 3 km downstream of the railway bridge Vadu Pasii. A large surface area of observation was chosen to determine an approximate existing population of *Spermophilus citellus*. To determine the species observed which could not be recognized and identified in the field, we turned to specialized literature, the Biodiversity Management Plan (BMP) and documentation held by the operator of gravel pit for the Vadu Pasii. Following the field trips were identified following types of habitats:

Figure no. 1 - Mesotrophic lakes and ponds with emersed vegetation of *Typha sp* (Rush). and *Phragmites communis* (Reed), and abundant submersed vegetation of *Myriophyllum sp*. (Water milfoil);

Figure no. 2 - Sand and ballast beaches with hygrophile vegetation of *Carex sp*. (Sedge);

Figure no. 3 - Mixed dense thickets with *Eleagnos angustifolia* (Russian olive) and *Tamarix ramosissima* (Saltcedar)

Figure no. 4 - Bush vegetation developed on the island created by the deposition of sediments from the railway bridge base, consisting of species of *Hippophae rhamnoides* and *Salix sp*., supplemented by various species of herbaceous plants.

Figure no. 5 - Steppic meadows with *Cynodon dactylon* (Devil's grass), *Onopordum acanthium* (Cotton thistle) and *Poa sp.* (Meadow-grass);

Figure no. 6 - Degraded lands due to uncontrolled and illegal disposal of waste, with poor vegetation, herbaceous.

Species identified: Of the plant species found, *Elaeagnus angustifolia* and *Tamarix ramosissima* are invasive. Among shrubs, the species with the highest abundance is *Crataeugus monogyna*. Less numerous are *Salix sp*. and *Hippophae rhamnoides*. Grasslands are populated by *Carduus nutans*, *Verbascum sp., Taraxacum officinale, Poa sp., Cynodon dactylon* and *Botriochloa ischaemum*. Vegetation is dominated by *Typha sp*. and *Phragmites australis* and the submersible by *Littorelletea uniflorae.*

Figure no. 7 – Plant species identified

Of fauna species identified (total 23), most are birds, which was the reason for the field visits: observation and identification of species of migratory birds that arrived on the lake resulted from operations and on the portion of river which crosses the territory held by the operator.

Figure no. 8 – Fauna species identified

So, a number of 36 individuals belonging to *Cygnus olor* were counted, including 4 juveniles and 53 to *Fulica atra*, of which only two juveniles. In the damaged area and immediately downstream of the tubes bridge were observed more specimens of *Galerida cristata* (total 4). Also, there were a lot of holes in the banks of the lake, made by birds (*Riparia riparia* and *Hirundo rustica*). Downstream of the tubes bridge over the Buzau River representing the technological road of the analyzed area was found an individual of the species *Ardea cinerea*, one of the *Ardea alba* and a covey of over 30 birds - *Columba livia* and a group of Black-headed Gulls - *Chroicocephalus ridibundus*. (12 individuals). Also common species are present such as *Pica pica*, *Corvus frugilegus*, *Passer domesticus*, *Parus sp.*, *Columba livia*, *Streptopelia decaocto*.

From discussions with fishermen encounter were obtained evidence that on the lake are other birds but they could not be observed on field visits, such as *Limosa limosa* and *Alcedo atthis*. Also, fishermen said they saw numerous individuals of Dice snake (*Natrix tessellata*) and European pond turtle - *Emys orbicularis*. There were a lot of holes observed specific to sand lizard (*Lacerta agilis*) scattered throughout the area. Among amphibians, *Rana sp.* is present both on the main lake and in ponds and small mesh, and *Bufo viridis* occupies especially holes dug in the bottom of the lake shore - marked on the map in green (there were at least 10 individuals encounters, both in the water, on shore, in their holes and hidden through the vegetation with *(Typha sp.)*.

Figure no. 9 – Holes in the bottom of the lake shore - marked on the map in green and Bufo viridis.

As for mammals, going upstream from the lake, on the meadow were identified Ground squirrel holes especially on the road. Locals also confirms that on downstream meadow, stretching on the left bank of Buzau river are many gopher - *Spermophilus citellus* - and can be seen most often near the dam that borders the water canal.

Figure no. 10 - Ground squirrel holes

CONCLUSIONS

A total of 6 types of ecosystems have been identified and mapped, all common. Of the species identified (37): - *Spermophilus citellus* is present in the standard form as mammal species listed in Annex II of Council Directive 92/43/EEC; - *Emys orbicularis* is listed in Annex II of Council Directive 92/43/EEC; - *Salix sp., Verbascum sp., Hippophae rhamnoides, Lacerta agilis* and *Natrix tessellata* are listed in the standard form of the site ROSCI0103 Lunca Buzaului under "Other important species of flora and fauna".- *Elaeagnus angustifolia* and *Tamarix ramosissima* are invasive species; - The remaining species are classified as "least concern" on the Red List of endangered species IUCN (International Union for Conservation of Nature).

Regarding the invasive species forming thickets and tall shrubs, it is considered that an effective and inexpensive method of controlling and limiting their spread is the encouraging of locals to exploit them as a source of wood for household heating. Also, according to the locals, hares and foxes have sheltered here, probably because it is a relatively isolated area, as the dense and thorny vegetation acts as a natural barrier.

Moreover, given the invasive potential of the Ground squirrel species, the existing fox population would act as a controling factor and prevent their possible overpopulation. During field visits no fox specimen has been met and the large number of Ground squirrel holes could not allow an effective assessment of population. Therefore, a campaign to collect this data is considered to be very useful for completing the biodiversity management plan for the area.Through the grazing activity of the sheep and goats herds of the locals (from which there are complains about the meadows being barely enough to satisfy the feeding needs of the livestock), the existing ecosystems remain to a certain steady state. However, in the present state (not enough pasture to support the relatively large number of animals) overgrazing is a potential threat to the integrity of the ecosystem.

It is also recommended to keep the lake banks in their current form so that they will allow the population of Emys orbicularis to further develop and consolidate the existing population.

Given the results of the monitoring program, it can be concluded that the mining activity can be done while still respecting the principles of sustainable development, namely industrial exploitation of mineral resources with low impact on the environment, therefore being an activity involving economic growth and quality environment protection.

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