The Best Variants of Rehabilitation of Degrading Soils in Hărău 3 Perimeter

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Abstract

Recovery of sand and gravel from mining perimeter Hărău has a big impact on the environment factors requiring rehabilitation of affected lands. The paper presents the main options for of rehabilitation of degraded soils in this area, namely: the use of the remaining gap as basin for fish breeding, as retention basin and water accumulation, as accumulation basin for irrigation and industrial water, as swimming basin with leisure purpose.

Keywords: perimeter of exploitation, environmental factors, affected soils, remaining gaps,economic circuit, water accumulation, embankments

Introduction

Hărău 3 perimeter, commune Hărău, in which the working operations are carried on for using sand and grave this located geographically in southern Apuseni Mountains, namely on the right bank of the main riverbed of Mureş river.

From the morphological point of view, the perimeter is bordered in south by the Mureş river and in north by the hill Serman.

The lands on which the mining activities will take place were hired by S.C.STRABAC Ltd.

The access to the mining perimeter activities is realized from Deva-Şoimuş road E 79, approximate 6 km. And in crossing of E79 road with DJ 761 road, it will change the direction of travel to right on the DJ 761 road, this road will go about 2,3 km. After which it will go on local roads in Hărău locality. From Hărău the access to the perimeter is through the southern part of the village on a dirt road (mining) that leads to the southern perimeter border and it is parallel to the western side of this perimeter.

Exploitation perimeter contour is well defined on the perimeter file on a scale of 1 to 25.000 and on the situation plan scale 1 to 1.000.

The coordinates of temporarily operating perimeter taken out by the National Agency for Mineral Resources under the name of Hărău 3 are presented in Table 1.

The largest impact on the environment factors constitutes the operating activities in Hărău 3 perimeter resulting a remaining gap that has a major impact on environment.

The reasons that support the necessity of remodeling and rehabilitation of affected soils are:

• The necessity of reintegration of degraded areas into productive circuit and /or ecological circuit of regions in which these are found, the fact leading to regeneration of their economic potential;

• Improving environmental quality;

• Eliminating the risk of land slip of anthropogenic landforms occurring in the territory by storage of waste materials in dumps;

• The reduction of the slopes ensuring diminution of erosion phenomena and accelerating the process of the installation of vegetation;

• Eliminating the negative visual impact of areas of selenic aspect;

• The possibility of creation of new storage spaces for different types of waste and/or other materials in remaining gaps or the pits or on the surface of the waste dumps.

Depending on the purpose of rehabilitation areas affected by the mining activities we distinguish the following types of interventions:

• For reconstitution of the landscape in the initial configuration;

• For changing the use destination according to advanced requests by the local community;

• For provisional systematization in the expectation of final decisions taken by appropriates bodies;

According to the legislation in operating any mining work either underground or surface is required to restore in the economic cycle the areas affected by the opening works, the works of preparing and exploitation of mineral substances.

The possibilities for the development an use of the remaining gaps resulting from the extraction of minerals by the surface works should take into account the following aspects:

– The development perspective of extractive activity in the area;

– The integration of the area to be rehabilitated in adjacent natural environment;

Table 1

Tabela 1

No. Point	X	Y	No. Point	X	Y
1	490.122	341.189	8	489.964	341.646
2	489.996	341.571	9	489.971	341.649
3	489.988	341.568	10	489.959	341.690
4	489.976	341.605	11	489.735	341.611
5	489.969	341.606	12	489.870	341.129
6	489.967	341.619	13	489.994	341.149
7	489.973	341.619	14	489.097	341.180

– The analysis of alternative uses of certain objectives losing their usefulness once the cessation of extraction;

– The morphology of the land resulting from technological activities of the quarry.

If for the waste dumps the rehabilitation works in order to restore in economic cycle can begin and are recommended to be conducted in parallel with the works of extraction, the use of the remaining gap involves a separate analysis to find optimal solutions for use. In this case being a great remaining gap flooded naturally on an area with a rich grand- water layer (the extraction is done once with the formation of the lake), it remains the following solutions of reuse.

– Fish breeding basins;
– Retention basins and water storage;
– Reservoirs for irrigation and industrial water;
– Lakes for recreational purposes.

Using the remaining gap as fish breeding basins

A similar type of use implies a slightly higher level of nutrients in lake water, the bottom of remaining gap should be formed level as possible and its banks should be planted with suitable vegetation.

Using the remaining gap as retention basins and water storage

In this case, it is allowed to use the remaining gap as a system of protection against the floods. In the arrangement of remaining gap for this purpose should be taken measures for preventing growth of spontaneous vegetation on the banks for avoid distortion of embankments.

Using the remaining gap as reservoirs for irrigation and industrial water

The remaining gaps of quarries can be used as decantation basins and/or of reaction by industrial enterprises or a source of water for irrigation of cultures in the area.

Using remaining gaps as lakes for recreational purposes

The operation of remaining gaps as accumulation reservoirs is completed by recreation of leisure areas, respectively biologically active regions.

The measures to be taken to achieve this purpose, are the following:

– The banks must be flattened to prevent accidents;
– Appropriate choice of trees and plants;
– Construction of holiday villages to adapt the new landscape created as type and size;
– Building an adequate system of communication routes.

The simplest possibility to use the remaining gap from technical, economic points of view and as environmental impact is that of the reservoir (accumulation lake).

In case of its using as a reservoir a careful research is required to establish measures to ensure the stability of submerged slopes and especially when the gap is formed from areas with slopes „in situ" and slopes of waste dump and deposited material is heterogeneous ant it presents a certain coefficient of loosening, being known adverse effect of presence of water in the body of embankments or slopes, with implications for stability.

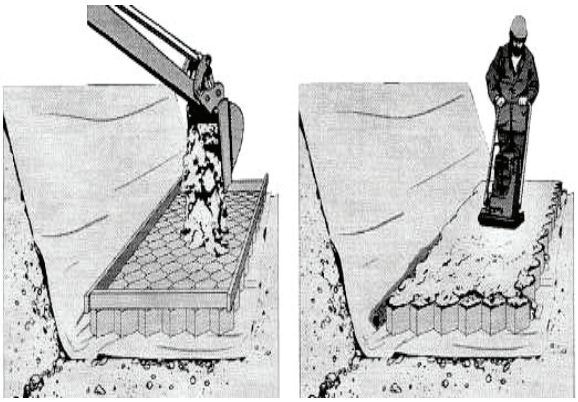
We note the importance of leading excavation activities, so that the marginal embankments that will delineate the accumulation of water have a geometry that ensure stability conditions before reaching re-arrangement of the remaining gap.

This consideration is important to avoid additional works related to the re-embankments or unfortunately situations or even expropriation of adjacent surfaces for re-arrangement of marginal embankments.

Near the formed lake it is recommended the realization of forested areas, which contribute to satisfying the aesthetic requirements as well as to the development of a vital area for development

Fig. 1. Works to stabilize the embankments

Rys. 1. Prace nad stabilizacją nasypów



of fauna in the area with beneficial effects over the environment factors.

The emergence of accumulation lakes may also determine some local changes, usually minor of climate, so that it is hard to differentiate between specific impact associated with the presence of water mass and the region climate with its normal fluctuations. The effects of an accumulation of water on the climate varies depending on the size of the accumulation of water (surface of lake of water, the depth of the lake), the topography of the region and its natural climate.

From topoclimatic point of view, the accumulation lake can give certain own items to meteorological phenomena creating a specific topoclimate to the water surfaces.

Such may occur:

– lower temperature;
– higher humidity;
– descent of air masses, increased effect of the wind to the flat surface;
– radiation and evaporation fog;
– stronger cloudiness;
– local rainfall;
– changes in evapotranspiration.

The water mass can have effects of reducing local thermal variations, cooling the air in spring and summer and warming it in autumn and at the beginning of winter.

Starting from usability possibilities of remaining gaps from outgoing quarries there are made the following remarks:

– the arrangement of remaining gap as accumulation lake enable the valorization of the water in all its forms of utilization being put into value as an economic good.
– by the gap arrangement as accumulation lake, the water is used efficiently and equitably with important role in preserving water resources of the area.
– The integrated management of water joins the problems of water use with the protection of natural ecosystems.
– The recovery of groundwater levels (hydrostatic level) is ensured must faster than in any other variant of gap use.

Possibilities for filling with water, use and constructive measures of arrangement of water accumulations

Taking into account that the filling with water of remaining gaps is a lengthy process it is recommended that the measures of artificial and natural filling with water of these facilities to do after ensuring stability and strengthening banks given the dependence of space between the former quarry-marginal embankments of excavation steps and the embankments of inland waste dump.

The timeframe for filling the remaining gap is conditioned by possible quantities of water resulting from natural feeding sources and possible water quantity from artificial sources and the total volume of required water. As a feeding source can be mentioned dewatering works. The variants of filling the remaining gap depending on the particularities of the area can be:

Natural:

– Using the potential of groundwater afferent to dewatering works or to the open aquifers levels of quarry perimeter. The possibility of filling by the natural way is conditioned by groundwater regime: flow capacity flow speed and piezometric level of aquifers intersected levels
– Precipitations that fall within the boundaries of quarry and spills on the slopes, etc.

Given that dewatering works will not be executed the maximum volume of water from per-

manent gap will be conditioned by the following factors:

– Flow capacity of infiltrations from marginal slopes;
– The rainfall volume;
– The evaporation level;
– Possible water discharge rate of effluent water to river area;
– The morphology and interior dump height given the surface altitude of the surrounding ground.

Artificial:

– By directing the water from valleys in the immediate vicinity of the perimeter by a minimum of hydrotechnical works of its deviation and controlled routing.
– Providing water supply from the river area through hydraulic works (water supply pipelines) or pumped supply system. The possibility of artificial filling can be realized by maintaining in running after finishing the excavation works, eventual drillings of drainage with free eruption and the use of the potential of aquifers artesian level by a minimum of hydrotehcnical works volume.

The artificial filling has a number of advantages:

– the remaining gap can take over the operation considerably faster;
– the operators may decide the rate that is appropriate for lifting the water in the lake;
– it is possible to correlate arrengement works (consolidaration and specific works according to final destination) with the quantity of water directed into the future lake.

Solutions of arrengement and strengthening of submersible embankments

At most quarries the remaining gap is bordered by a part of the final embankments of the quarry and the other side of the interior volume embankments formed of loose rocks. this situation ,filling the void with water ,the heterogeneous material of which the waste dump is made suffers a rapid saturation process (a first saturation),forming in its mass a two-phasey system (solid-liquid) rock-water which can release land slides by flow due to lique faction.

To avoid the phenomena of lack of stability the following solutions are proposed to ensure embankments stability of dump steps that will be submerged:

• waterproofing measures of embankments of dump steps according to the mining experience of Germany, Greifenhain quarry;
• execution of retaining wall or gabions at submerged embankments foot;
• using geogrids in arrangement of submerged slopes;
• the cover of embankments with rockfill natural stone or concrete pieces that can be recovered from concrete platforms and access roads which will be dismantled once the cessation of the mining objective;
• planting on embankments surfaces of hydrophilic plant

It is also necessary to ensure protection of water storage are by creating curtains forests with the width of at leat 50 m made up of plants of hydrophilic water loving species

• application of special solutions for improving the stability of dump steps neighboring the water accumulation by modification of mechanical and physical properties of rocks ;
• surface consolidation;
• a deep consolidation vibrocompacness;
• consolidations by implanting special inserts as geogrids or geosynthetics.

Proposals and arguments for arranging accumulation lake with recreational purposes

The fishing sport in our country has experienced during the last 10 years a visible revival the owners of private lakes having determining role by investments made by them every year in developing the fish stock of the lakes. In the development and modernization of infrastructure in the area as well as tourist facilities realized around the lakes. Thus, we meet frequently lakes and ponds that provide to fisherman fishing memorable parties but also services of camping or accommodation in wooden cottages and villas, so that fishing parties turn slowly in small leaves of rest and leisure for fisherman and their families.

We can say that through these individual projects in recent years we are witnessing the development of a new branch of Roumanian tourism, which we heave named suggestively pisciculturral tourism. I believe that piscicultural tourism is beneficial for fishermen and in the same measure for location area of this lake that will thrive by attracting new investors, the construction of future highway and undertaking development projects and modernization of the area.

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Najlepsze warianty rekultywacji gleby w okręgu Hărău 3

Ekspolatacja piasku i żwiru w okręgu Hărău 3 wywiera duży wpływ na środowisko. Po zakończeniu eksploatacji koniczne jest prowadzenie rekultywacji terenów zdegradowanych. W artykule przedstawiono główne kierunki rekultywacji w tym rejonie: wykorzystanie wyrobisk jako zbiornika do hodowli ryb, jako zbiornik rertencyjny, jako zbiornik wody do nawadniania ternów rolniczych, jako zbiornik wody przemysłówej jako basen i tren rekreacyjny.

Słowa kluczowe: obszar eksploatacji, czynniki środowiskowe, rekultywacja gleby, zasypywanie wyrobisk, obieg ekonomiczny, akumulacja wody