

SURVEY ON THE PROCESS OF ENVIRONMENTAL IMPACTS OF OPENCAST MINING

József PÁJER^{a*} – Imre BERKI^a – Zoltán GRIBOVSKY^b – Péter KALICZ^b – András POLGÁR^a – Katalin SZABÓ^a

^aInstitute of Environmental and Earth Sciences, The University of West Hungary Faculty of Forestry, Sopron, Hungary,

*jpajer@emk.nyme.hu, H-9400 Sopron, Bajcsy Zs. Str. 4.

^b Institute of Geomatics and Civil Engineering, The University of West Hungary Faculty of Forestry, Sopron, Hungary

1. PROBLEM POSING

The opencast mining is a very offensive influence on the natural environment, the state of the environment was developed, depends on the duration, the method of the mining and on the quality of the exploited raw material. The demand for building materials has increased in the last 15 years, several new mines have been opened in the western Transdanubian region. More and more cases of unauthorised and illegitimate mining activities have occurred. It follows that, the surface of Hungary is covered by a number of quarry pits that were made out of mining cultivation.



Figure 1. Gércé (alginit), 2005



Figure 2. Gércé (alginit), 2011

2. THE TARGET OF THE SURVEY

The target of the project is to identify the impact area of the opencast mining, exploring the factors, that influence the impact range of the impact factors, keep in mind the preservation of the natural environmental requirements.

Systematize these impact factors, and develop a check-list, that supports the forecast of the impact factors.

3. METHOD AND RESULTS

The survey is based on a 5 years of returning monitoring, that allow of the aerial photography, and the local collection of data.

The research took place on 20 allocated sampling areas, in the course of which we made ecological, hydrological and soil tests. However experiments were made on other minesides as well. According to the impact parameters 8 impact processes were identified. The impact area was examined by using pairs of aerial photos about the mining areas. During the examination different types of impact processes were identified.

Ecology

Opencast mining is an intensive disturbance which eliminates the living world for a certain time. As result of opencast mining a more diverse abiotic conditions has been established compared to the earlier surface. The bigger the surface of the opencast mines, the more intensive are its effect on the living world of the surrounding landscape.

As result of the succession, the biodiversity of the opencast mines is higher, than the biodiversity of the surrounding agricultural area. As steppingstones the vegetation of mines facilitate the migration of plant and animal species in the agricultural landscape.

According to the *table 1.* the relative naturalness of the investigated mines are depending mainly on the earlier plant cover, the moisture content and the type of rock material.

Table 1. The relative naturalness of the vegetation depending of some main factors

Degree of moisture	The vegetation of the earlier surface				increase of the naturalness
	Nature-close dry grass and forest	Nature-close flood plain forest and grass	Degradated grass, and forest, hobbygarden	Arable land, fallow	
Dry	rockmine		sandmine	gravelmine	increase of the naturalness
	gravel-and sandmine		claymine	claymine	
Wet		gravelmine		gravelmine	
	claymine			claymine	

increase of the naturalness

Hydrology

Removing of the surface covering topsoil (confining) layer and the exploitation of the mineral resources, which is generally gravel in the West-Transdanubian region, causes long lasting effects. The original, better protected state of the groundwater resources generally decreases after mining activities. Lakes have a very intensive connection with the neighbouring groundwater bodies therefore any pollution in the surface water body of the lakes endangers also the groundwater resources.

High evaporation rate of the mine lake surface has also a considerable effect on the water balance of the neighbouring area. The surrounding groundwater level can be depleted (compared to the original state) as a result of higher evaporation induced groundwater withdrawal of the lake in dry periods. The surrounding groundwater quality may be in a danger also, if groundwater withdrawal happens near the lake and its surface water body is in the recharge area of the water exploitation.

In case of mine lake (Bük I.) was examined as an example of numerical modeling. We used Processing Modflow model environment for calculations.

The numerical model aquifer was a homogeneous gravel layer. We used permanent model. Near the lake (about 2-300 m distance) the maximum groundwater level depletion was estimated about five centimeters by Modflow. This value is less than the depletion estimation of the analytical solutions in case of the same mine lake: the lake is handled as a long channel: more than 15 cm depletion in 3100 m wide region along the channel; or as a well (according to geometry more realistic): more than 15 cm depletion around in a 140 m wide zone the lake. It has to be note that using non permanent model in a dry summer periods the groundwater depletion can be more significant than the above mentioned ones.

The survey is done within the TÁMOP 4.2.1. B „Preservation and sustainable utilization of our natural heritage” subproject, in the part of „The impact of opencast mining on the natural environment”.

Acknowledgements: We wish to thank for TÁMOP 4.2.1.B-09/1/KONV-2010-0006 and HAS Bolyai scholarship.