THE CHARACTERISATION OF THE STERILE DUMP FROM THE HUSNICIOARA QUARRY – MEHEDINTI AND THEIR IMPACT ON THE ENVIRONMENT

CARACTERIZAREA HALDELOR DE STERIL DIN CARIERA HUSNICIOARA – MEHEDINȚI SI IMPACTUL LOR ASUPRA MEDIULUI

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Abstract: *The paper presents the pedological and agrochemical features of the sterile dump Husnicioara, District Mehedinti that has a surface of 190 ha. There are presented the polluting effects of the sterile dump Husnicioara on the environment.*

Rezumat: *Lucrarea prezintă caracteristicile pedologice şi agrochimice ale haldei de steril Husnicioara în suprafață de 190 ha. Sunt prezentate efectele poluante ale haldei Husnicioara asupra mediului înconjurător.*

Key words**:** *sterile dump, quarry, land degradation, soil profile.*
Cuvinte cheie: *halda de steril, cariera, degradarea solului, profil de sol.*

INTRODUCTION

Nowadays, there is a multitude of factors that can destroy the soil, and to disrupt certain ecological equilibrium among them, between them and from them and the whole biosphere.

One of the most aggressive and destructive factors of the soil is the surface mining which can determine essential changes of the geomorphology and natural hydrology of the affected zone, determining ecological changes, especially of the edaphic factors. The surface mining of the lignite produces total or partial changes on the soil on a period that, in most of the cases, overpasses 10-15 years. There are taking place the inversion of the different geological strata, the natural migration of the nutritive elements of the soil, the acceleration of the erosion process, the degradation of the landscape, in the place of the productive terrains resulting sterile dumps. They form after uneven display of the sterile material of the coal deposit. Within the display process, due to the technological fluxes from the quarries there can not be respected a certain succession of sterile display, that to comply with the initial lithology. This is why, the display is considered to be chaotic, resulting a heterogeneous mixing of rocks that have different lithological features even on small distances. Also, the impact of the mining activity has determined a series of changing on the coal deposits, on waters (streams and watertable), on the climate, vegetation and social communities.

MATERIAL AND METHOD

As The Husnicioara quarry belong to the ME Mehedinti. It is located near the Husnicioara village, in the East part of the Turnu Severin town, at a distance of 17 km away of it. The climate is Cfax that characterises a subhumid zone with mild winters and hot summers, three months per year (June, July and August). Within this zone are felt Mediterranean influence, the annual temperature is 11.6°C, and the multiannual average value of the rainfall is 661 mm. The vegetation – before mining – the woods were composed in variable proportion of

oak in the dominant level. Within the Western part there was cherry tree, lime tree, sycamore maple. The herbaceous vegetation was well represented by secondary lawns that were set up in the place of the oak woods.

After the surface mining and the formation of the sterile dumps, the vegetation is totally modified. Such way, the woody vegetation completely disappears by clearing the 151 ha and the herbaceous vegetation is strongly reduced.

The Husnicioara, along with the nearby sterile deposits, since the beginning of the exploitation occupy a surface of 614 ha (table 1).

Table 1

The surfaces occupied by the Husnicioara quarry
and the nearby sterile dumps (Huidu, 2002)

#	Specification	The occupied surface (ha) of which:					
		Total		Agricultural		Woods	
		ha	%	ha	%	ha	%
1	Quarry	329	53.6	143	43.5	186	56.5
2	Sterile dumps	285	46.4	194	68.1	91	31.9
3	Total	614	100	337	54.9	277	45.1

No matter the mining technology, the surface quarries modify the natural lithological structure on a 2-3 m depth at 150-200 m. Besides the terrain that is located within the exploitation perimeter large surfaces are definitively occupied by sterile display that can have 15-20 m height, up to 90-100 m. In order to characterize pedologically and agrochemically there were made two soil profiles of which there were taken samples. Their analysis was made using methods that are accepted in our country.

RESULTS AND DISCUSSIONS

Initially, within the zones that are affected by the Husnicioara quarry there were the following soil types:

- reddish preluvosoil
- typical, pseudogleysated preluvosoil
- pseudogleysated luvosoil
- vertic pseudogleysated luvosoil
- albic pseudogleysated luvosoil
- typical eutricambisoil

The soil unit nr. 1 US_1
Name: entiantrosoil
Surface: 283.4 ha
General conditions of formation
Relief: sterile dump
Bedrock: silt, sand
The depth of the water table: deeper than 10 m
Vegetation: herbaceous associations
Pedological characteristics

Table 2

The granulometric composition of the deposited materials (Husnicioara quarry)

Nr. profile	Strata (cm)		Mechanical analysis					
			Thick sand %	Fine sand %	Silt %	Physical clay %	Colloidal clay %	Texture
9	S_1	0-23	21.5	75.3	0.3	3.0	2,9	N
	S_2	23-37	39.3	51.9	3.2	7.6	5,6	NL
	S_3	37-62	45.5	47.3	4.0	7.1	3,2	N
	S_4	62-128	30.9	62.1	3.7	5.4	3,3	N
10	S_1	0-25	70.0	21.0	7.0	3.9	2,0	NL
	S_2	25-50	44.8	30.4	16.6	10.2	8,2	LN
	S_3	50-75	46.2	28.3	17.4	12.2	8,1	LN-LA
	S_4	75-150	50.0	26.8	16.6	9.0	6,6	LN
Minimal values			**21.5**	**21.0**	**0.3**	**3.0**	**2.9**	**N**
Maximal values			**70.0**	**75.3**	**17.4**	**12.2**	**8.2**	**NL**

The soil unit nr. 2 US_2

Name: typical antropical protosoil

Surface: 1.6 ha

General conditions of formation

Relief: sterile dump

Bedrock: silt, sand

The depth of the water table: deeper than 10 m

Vegetation: herbaceous associations

On the basis of the data from the table 1 there results that the entiantrosoils from the sterile dumps of the Husnicioara quarry have the following pedological characteristics: the texture is silt-sandy, silty or sandy with a high content of thick sand (21.5 – 70.0%) and fine sand (21.0 – 75.3%), lower of silt, (0.3-12.2%) and of physical and colloidal clay (2.9 – 12.2%). The bonitation mark is 15, the anthropic protosoil being grouped in the 5^{th} class.

Table 3

The main agrochemical features
(Husnicioara quarry)

Nr. profile	Depth (cm)	Chemical features					
		pH (H_2O)	$CaCO_3$	Humus %	Nt %	P ppm	K ppm
9	0-23	8,7	4,8	0,40	0,16	6,96	44,86
	23-37	8,9	4,8	0,50	0,16	4,52	39,95
	37-62	9,0	3,2	0,40	0,20	5,09	33,24
	62-128	8,0	2,4	0,40	0,08	11,09	33,21
10	0-25	8,1	3,9	0,40	0,16	14,05	42,44
	25-50	7,9	4,0	0,20	0,08	11,98	49,50
	50-75	8,2	4,2	0,30	0,11	15,93	50,85
	75-150	8,2	4,2	0,30	0,12	13,03	30,31

On the basis of the data from the table 3 there results that the entiantrosoils from the sterile dumps of the Husnicioara quarry have the following agrochemical characteristics:

- the reaction is weak to moderate alkaline (pH = 7.9 – 9.0)
- the lime content is low to moderate (3.2 – 4.8%)
- the humus and total nitrogen content is extremely low (0.2 – 0.5%), respectively (0.08 – 0.20 %), the sterile dumps being very low supplied with nitrogen
- the soluble phosphorus is also low (4.52 – 15.93 ppm P) being very low supplied with phosphorus
- low and middle supplied with available potash (30.31 – 50.85 ppm K)

Analysing the data from the third table it can be noticed that the sterile dumps from Husnicioara quarry have a low degree of fertility. This fact assumes special measures to fertilize them in order to be recultivated.

The impact of the mining exploitation on the environment

The surface mining quarries have a strong harmful effect on the environment on: air, water, flora, fauna, the landscape and the loco communities, the cultural patrimony, the health of the populace and the agriculture (Mocanu R., 1994).

The air pollution takes place by the following ways:

a) Solid suspension emanation (rock dust from the quarry, transport devices, coal dust, ash from the power plants for heating.
b) By gases emanation (methane, explosion gases, cars gases, gases from the power plants)

The impact on the water

The mining activity does induce changes in the surface as well on the water table. These effects consist of:

- the harmful effect on the hydrographyc and hydrogeologic regime because of the mining buildings and the permanent spreading of the quarry perimeter.
- The influence on the quantitative water resources from the drinkable watertable used by adjacent loco communities.
- The harmful effect on the quality of the waters that flow into the streams because of the residual waters resulted from the mining activity.

The impact on the climatic conditions

The surface quarries influences the atmosphere by temperature changing, light, humidity, rainfall, bioclimatic regime of the microclimate and the mezoclimate, the contamination with gaseous, liquid and solid emissions. The drought phenomenon is intensified due to the increasing of the soil temperature, the decreasing of the air relative humidity, the decreasing of the landscape capacity to ease the wind speed, the increasing of the amplitudes of the temperature.

The perimeters of the lignite quarries are a potential polluting environment. The exhausted dust form lenticular clouds during the winter and during the summer make the surroundings opaque increasing the indirect radiation while the direct one if filtered.

The impact of the surface quarries on the landscape and the relief

The surface mining completely changes the landscape. In this manner, the former hills became plains and the former lowland became hills.

The impact of the surface mining on the agriculture

The strongest impact of the surface mining is done on the agricultural activity through:

- the reducing the productive surface over 15 years
- the affecting the soil from the nearby zones of the mining perimeters or on the transport terraces by the solid or liquid residues

- the reduction of the woods surfaces
- the destroying of the agricultural and woody vegetation with harmful effects on the flora and fauna

The impact on the flora and fauna

The impact produced by the mining activity on the flora and fauna is local and of a long term and refers to:

- the destroying of the natural flora and fauna as a result of the removing the upper soil layer
- the diminishing of the woody surfaces by clearings and totally disappearing of the forester ecosystem from these places
- the diminishing of the wood quantity after the mining activity stops.
- the diminishing of the structure and function of the local ecosystems till the disappearing of certain species or even associations of species.
- The reinstallation of the vegetation on the sterile dumps yet with a different structure.

The diverse pedoclimatical and relief condition that existed on the surface mining quarries have permitted the installation of rich and diverse vegetation.

The first plants that appear are the annual species, less pretentious that by their characteristics can stabilize the sterile dump and prepare the land for the installation of the specific vegetation of the zone.

Meanwhile, on the affected surface, a new type of vegetation has been installed, different from the initial one. The slow recovery of the soil permits the installation of the specific vegetation that includes a high number of perennial species.

Within the quarries and on the surface of the sterile dumps there will appear a new type of herbaceous vegetation. The vegetation starts to develop 2 years after the mining activity stops. At the beginning there will be less pretentious species and adapted to the poor and shallow soils as: *Equisetum palustre*, *Ononis spinosa*, *Tussilago farfara*.

CONCLUSIONS

1. The sterile dumps from Husnicioara, District Mehedinti have a surface of 190 ha.
2. The surface mining quarries produce a high impact on the environment, affecting the watertable and streams, the air, the landscape and the loco communities.
3. The highest impact is made on the soil, determining its degradation and taking it out of the production activity for a period of over 15 years.
4. The agrochemical features of the sterile dumps show that they have an alkaline reaction, are very scarce in nitrogen, phosphorus and potash.
5. The fertility degree of the sterile dumps from the Husnicioara quarry is very low that assumes special measures of fertilization by increasing the organic matter content by different organic fertilizers and composts.

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