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Ecological reconstruction of fly ash and slag landfills in order to achieve ecological coherence between degraded ecosystems and Natura 2000 sites

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INTRODUCTION

Bacau Power Plant

Fly ash and slag landfill

Fly ash and slag, a result of combustion of coal at high temperature, are non-hazardous industrial waste.

Commercialization of the waste was attempted, but without success, so the only solution remained was disposal.

Following alignment with European environmental rules were imposed and revising the current exhaust systems transport and storage of products resulting from the combustion of coal and some power plants have dropped the use of coal.

ROSPA 0063, ROSCI0434 , Fly ash landfill

The Bacau slag and fly ash landfill is located in the Riverbed of the River Siret, near the three Special Protected Areas of Community importance:

1) ROSPA0063 *Buhusi-Bacau-Beresti* Lakes,
2) ROSCI0434 Middle Siret Valley extended in 2016
3) ROSPA0072 Middle Siret Valley.

This location in a ecologically sensitive area implies the need to remediate the contaminated site.

MATERIAL AND METHODS

Fig.1. Location of fly ash and slag landfill

Study area. The slag and fly ash landfill is placed outside Bacau City, located at 4 kilometers distance of the thermal power plant Bacau, eastward, in the Riverbed of the Siret River.

Annual and monthly rainfall varies quite importantly.

The area of the landfill consists of a mosaic of agricultural, aquatic and forest ecosystems.

MATERIAL AND METHODS

Characteristic data of the landfill

Type of landfill : Riverbed deposit (Siret River)

Current height: the average height of the dam base is of 5.00 meters

Current volume: V = 3.37 million cubic meters

Area: S = 46.77 hectares

Number of compartments: 3

MATERIAL AND METHODS

Characteristics of coal

Table 1. Coal (Lignite) composition

Carbon content	Sulphur content	Total moisture	Ash content
20%	0,7%	37-46%	20-31%

MATERIAL AND METHODS

Table 2. Analysis of samples of waste (slag and ash)

No.	Test	U.M.	Sample/value		
			ZI	Z2	Z3
1	The dry matter	%	75,88	60,5	3
2	Copper	mg/kg d.m.	53,8	48,4	43,8
3	Cadmium	mg/kg d.m.	<0,5	<0,5	<0,5
4	total Chromium	mg/kg d.m.	50,96	40,9	56,90
5	Zinc	mg/kg d.m.	89,5	109	41,39
6	Nickel	mg/kg d.m.	63,80	59,4	72,28
7	Plumb	mg/kg d.m.	7,50	2.67	3,06

MATERIAL AND METHODS

- Heavy metals were determined in fly ash and slag using SRISO 11047-99 method.
- Soil samples were taken from three deep: 0-5 cm, 15-20 cm and 30-35cm from surrounding area. Heavy metals were dosed with total forms atomic absorption spectrometry method.
- Coal and its by-products have significant amounts of radionuclide's including uranium, thorium which is the ultimate source of the radioactive gas radon and thoron respectively. Radiation hazard from airborne emissions of coal-fired power plants have been cited as possible causes of health in environmental. By multichannel gamma spectrometry were determined radionuclide's content.

RESULTS AND DISCUSSION

Table 3 presents the higher heavy metal concentration values obtained from soil sampled taken at depths between 0-35 cm. from surrounding area compared with analysis of fly ash.

Table 3. The higher heavy metal concentration values(ppm)/ Analysis of samples of slag and ash (mg/kg d.m)

The cardinal direction	**Cu**	**Zn**	**Pb**	**Ni**	**Cr**	**Cd**
In site	25	66.5	25	30	22	0,85
N	42.5	121.5	48.5	60	30	1.4
Reference values	20	100	20	20	30	1
Sample (fly ash and slag)	53,8	89,5	7,50	63,80	50,96	<0,5

RESULTS AND DISCUSSION

- The values for heavy metals content are higher than normal, but below the alert threshold for less sensitive soils (Cu, Cr, Ni, Zn, Pb).

- Assessment of the natural radionuclide concentrations in both the coal and the waste resulting from combustion within the limits of the literature cited is somewhat higher than the soil in the area.

RESULTS AND DISCUSSION

The three compartments were covered with 30 cm of vegetative soil and **β global** radiation concentration values in the study area was within normal range from the previous years of the area (Table 4).

Table 4. **β global** radiation concentration values in the study area

The place of sampling	**β global radiation concentration values (**Bq/kg)
Compartment 1	327,1
Compartment 2	442,4
Compartment 3	252,8
Vegetation	329,0
Average annual vegetation	381,2
Soil	472,3
Average annual soil	528,4

CONCLUSIONS

- The EU promotes green infrastructure to enhance Europe's natural capital. The Natura 2000 network constitutes the backbone of the EU green infrastructure.
- Bacau slag and fly ash landfill is located between two Natura 2000 sites, in Bistrita and Siret River basins, but on top of that is also located on the Carpathian migratory corridor.
- Since the landfill occupies such a large area within this important corridor, and it is located near the three Protected Areas of Community importance, can be apply habitat restoration measures at the landfill site to improve the habitat quality of the area, thus favoring. the presence of protected bird species, and at the same time to improve overall connectivity between the Natura 2000 designated sites.

Ardea purpurea

Cygnus Olor

Thank you !