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THE STUDY OF DISPERSION OF DUST PARTICLES FROM THE PONDS OF THE POWER PLANT PAROSENI

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Abstract

One of the sources of pollution in the Jiu Valley is the Thermal Power Plant Paroseni by the gas emissions and by storing carbon and ash resulting from the technological process in ash and slag deposits. Thermal Power Plant Paroseni has large areas of ponds decommissioned and not reentered in natural cycles, and significant quantities of powders pollutants are transported by wind. The purpose of this paper is to identify areas with high dust pollution through the study of dispersion from the slag and ash ponds of the Thermal Power Plant of Paroseni.

***Key words**:pollutants, dispersion, powders*

INTRODUCTION

Jiu Valley is characterized by a mountain climate with average temperatures range from – 5° C to +6° C in winter, and +18° C to +28° C in the summer months. Due to depression location are occurring thermal inversions, and reduced movements of air masses create favorable conditions for stagnation of masses at low height above the ground. Relative air humidity, the monthly averages are higher in winter (84-88%) and lower in the summer (62-70%). Wind is having the NS direction - direction to Jiu Valley - especially predominant in the southern sector (11%) and on the NW with a frequency of occurrence of 5.1%, calm atmosphere, in all cases analyzed, has a frequency of 69, 9%. The EV transverse direction is almost zero wind speed frequency. Affected by wind speed values were lower due to the effect of specific housing depressions; prevailing winds are from the south and north.

Central Power Plant Paroseni is situated on the lower terrace of the right side of the river Jiu in proximity to Vulcan city, 8-10 m from the railway Vulcan - Paroseni - Lupeni. This site was determined by the existence of numerous coal extractions in the area (Figure 1). It is located on the national road DN 66 A, which connects Craiova and Targu Jiu.

Neighborhood: North - Railway Livezeni - Lupeni, South - DN 66 A, East - Mining Exploitation access road Paroseni, West - Jiu River.

Thermal Power Plant Paroseni is a cogeneration power plant supplying heat and power production. Works with coal as fuel base and provide heat for the residents of the 4 mining towns in the area: Petrosani, Vulcan, Lupeni, Aninoasa.

Slag and ash deposits of the power plant Paroseni are having as surface area 56 ha:

- Ash and slag deposit for case of accidents (S = 10 ha)
- Deposit Valley Caprisoara (S = 46 ha)

Radon deposits (S = 10 ha), Ijak (S = 8 ha) and Feres (S = 10 ha) are reentered in natural circuit and covered with grass.

Paroseni Thermal Power Plant is evacuating hydraulically the ash and slag discharged from the combustion of coal in to the slag and ash deposit Caprisoara Valley. In case of accidents, slag and ash is deposited in the special deposit for cases of crash. The ratio of the water / ash is about 10: 1. Slag and ash deposit Caprisoara Valley is a valley deposit consisting of two deposits, located at 1.5 km from the Power and Thermal Plant. It occupies an area of 46 ha, with a total capacity of 5320000 m3.

Slag and ash deposition is made by levels, consisting from raised slats performed

successively in different compartments of the deposit. Water from ash and slag transport is recycled to the Power Thermal Plant by pumping.
To avoid dissipation of ash from deposits is used a water network in order to spray the deposits.

POLLUTING AGENTS

For the production of the electricity, the thermal power plants are using a source of primary energy - solid fuels. Chemical elements in contact with oxygen that produce heat (exothermic reactions) are: the carbon, hydrogen and sulfur. The final products resulting from the combustion are: carbon dioxide, water and sulfur dioxide.
Solid fuels, in addition to fuel, contain more sterile, which will be found after the combustion process in the form of slag and ash.
All products resulting from the combustion of solid are pollutants in the sense that they are changing the balance of the external environment or act directly on the animals and plants.
The main pollutants from power plants that are emitted by the chimney are: sulfur oxides (SO2 and SO3), nitrogen oxides (NO and NO2), carbon monoxide and carbon dioxide (CO and CO2), dust (fly ash particles unburned coal, clay, earth) and in smaller quantities: tars, hydrocarbons, soot, sulfates, organic acids, etc.
All the usual fuels (coal, coke, fuel oil) contain ash from non-combustible solid substances.
Thermal Power Plants are located near water sources such as rivers. The water used for cooling is reintroduced into the river at a temperature higher than that at which it was captured from the river. Therefore, power plants contribute to increasing water temperatures in the river, with all the negative effects for river ecosystem.
Slag and ash from Thermal Power Plant Paroseni has the following composition: 47.68% - silicon dioxide (SiO2), 22.16% - aluminum oxide (Al2O3) 9.44% - iron oxide (Fe2O3) 5.38% - calcium oxide (CaO) 2.28% - magnesium oxide (MgO) 0.64% - sodium oxide (Na2O) 1.08% - potassium oxide (K2O) and 10.78% of other elements.

THE EFFECTS OF PARTICLES AIR POLLUTION ON THE ENVIRONMENT

In the interrelationships between man and his ambient environment, the last one exerts multiple influences on man, one of the most important is the effect on health.
Pollutant environmental action on the human body is very diverse and complex. It can start from simple discomfort to human activity, so-called discomfort, to strong disturbances of health.
The direct influence of air pollution on human health consists from body changes that occur in people exposed as a result of their contact with various air pollutants. In most cases, the direct action of air pollution is the result of interaction of several pollutants simultaneously present in the atmosphere and only rarely action of a single pollutant.
Air pollution dust could cause serious damage to the human body. Powders are irritant pollutants, fibrosis, and allergy.
Affections that can cause air pollution with dust on the human body are inflammations, rhinitis, pharyngitis, laryngitis, and bronchitis. If action is long lasting pollutant may occur chronic diseases.
In addition to the affections listed above, powders, especially those with large density persist in the lung, lung elasticity is decreasing as foreign body reaction with formation of new tissue around, all that being causes of fibrosis.
Organic or mineral powders as gases (nitrogen oxides, sulfur, carbon) or volatile substances from insecticides, detergents, plastics, drugs, may cause acute rhinitis, asthma or ocular problems (ex.: conjunctivitis) or skin problems (eczema, hives, etc.)
On vegetation, dust particles are deposited on their leaves preventing normal development. Depending on the thickness of particles deposited on, plants can even lead to death.

EXPERIMENTAL DETERMINATION

To identify possible polluted areas with high particles from settling ponds at Thermal Power Plant Paroseni was used Meti-Lis software release 2.03.
Meti-Lis 2.03 software allows us to determine how the dispersion of certain pollutants from

human activities, taking into account the emission rate and other terms of issue such as location, the amount of pollutant, temperature and meteorological factors every hour or during the mediation.

Studies have been conducted on average values of the month of September 2014. For the study we used the following climatic data:

- The average monthly temperature – +10°C,
- Average monthly wind speed - 10 m/s
- Wind direction - NE.

Possible dispersion of powders obtained for the deposit Caprisoara, which belongs to Thermal Power Plant Paroseni is shown in Figure 1.

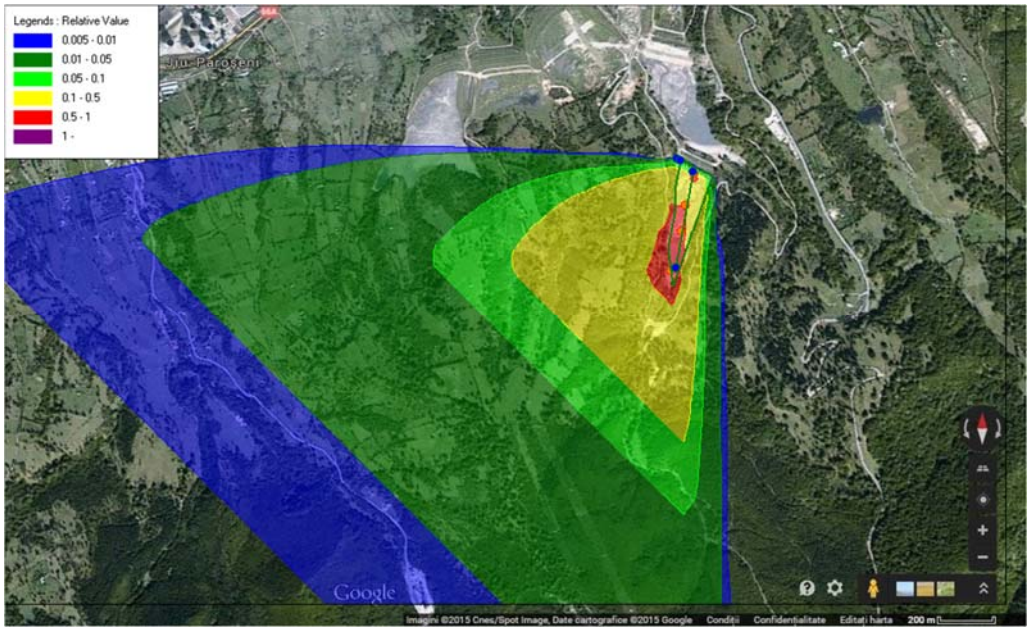

Figure 1. Wind dispersion of dust powders driven from the inactive lake Caprisoara

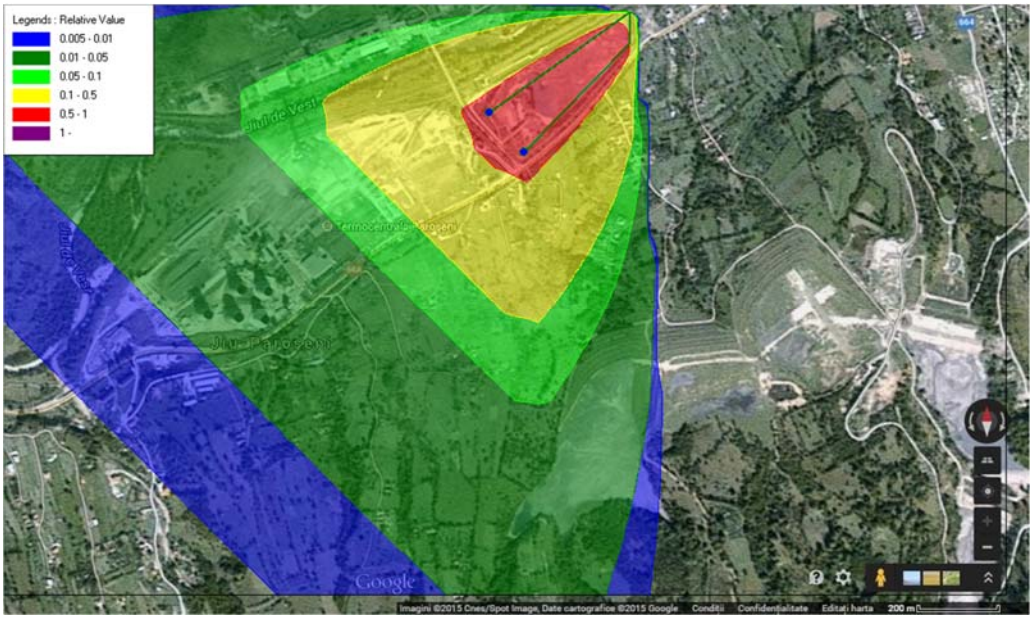

Figure 2. Wind dispersion of dust powders driven from the emergency lake deposit

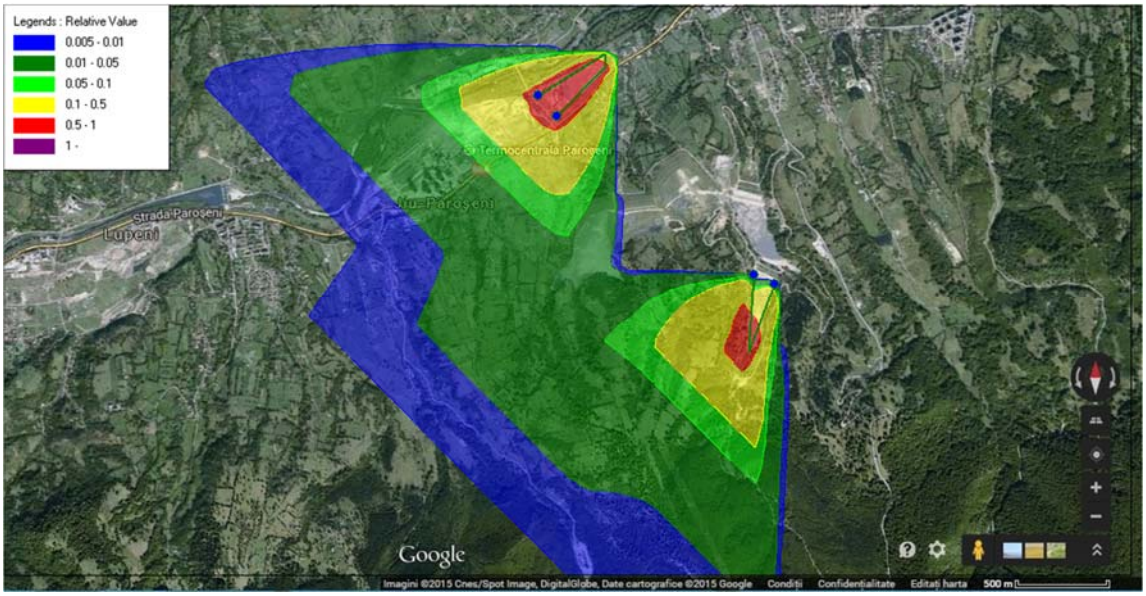

Figure 3. Wind dispersion of dust powders driven from the emergency lake deposit and from the inactive lake Caprisoara

The analysis was done for areas where ash and slag deposition ceased and for emergency deposit. The rest of the currently active surface of the deposits does not raise problems relating to entrainment of air dust particles as they are covered with water.

From the analysis of dispersion maps we can see that the dust raised from the lake Caprisoara is transported by air currents toward Valcan massif, only a small part of them reaching the habited vicinity of the Thermal Power Plant Paroseni.

In case of emergency lake deposit, wind-blown dust from its surface affects residential areas near the Thermal Power Plant Paroseni (Figure 2).

As a result of the dispersion of particles carried by wind from the slag and ash ponds lead to air pollution. Non-reduction of pollution cause serious damage to environmental factors, with greater impact on vegetation because of the way of dispersion of pollutants.

CONCLUSIONS

One of the main air pollutants produced by Thermal Power Plant Paroseni is solid particle pollution (dust).

From the lake surface of slag and ash, wind train large amounts of dust that is dispersed on the surrounding areas.

Dispersion of pollutants raised from the slag and ash ponds from Thermal Power Plant Paroseni is performed in the NE direction – to Massif Valcan, not affecting large habited areas.

Emergency lake is affecting in the highest proportion habited area near the Thermal Power Plant Paroseni.

To reduce particle pollution, redevelopment measures of the deposit are necessary to reintroduce these surfaces in natural circuit.

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SECTION 02
SUSTAINABLE DEVELOPMENT OF RURAL AREA