

REHABILITATION AND RECOVERY OF HISTORICALLY CONTAMINATED SITES

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Abstract

It is estimated that pollution caused by waste and inorganic waste (minerals, inorganic materials, metals, salts, acids, bases) from industry (including mining) affects approximately 560 ha of the total area of our country, most areas are located in those counties where the mining and ferrous and nonferrous industries are highly developed (Galati - 177 ha, Maramures - 103 ha, Suceava - 106 ha, etc.)

Inventories of soil pollution in Romania (conducted before 1989) showed that 900,000 hectares were affected differently by various types of pollutants. After 1989 there was a reduction of some types of pollution, due to lower quantities of fertilizers and pesticides applied, noxious emission reduction or closure of industrial and agricultural units. The present paper wants to present a technology through which the beneficiaries of polluted sites would benefit directly from more efficient technological processes and economic growth, causing a new "product" to be used successfully as a foundation basis.

SOILS'S REMEDIATION METHODS: These methods include the entire range of healing techniques, designed to neutralize or block the flow of nuisance caused by pollution.

The classification of these methods is depending on the application site in relation to the pollutant site, and technical principles of remediation. Classification based on the criterion of the application site - Methods applied outside the site consisting of release of the soil from its natural environment (by excavation), its transportation out of site and execution of remediation works in specialized centers.

- Methods applied on the contaminated site - consist of evacuation of the polluted soil from its natural environment, but the contaminated products are no longer transported outside the site, but are treated on site, using mobile remediation installations. - Methods applied "in situ" have as particularity, the execution of remediation works directly in the polluted environment, without using excavation works. Classification according to the technical principles of remediation: - Physical methods for remediation of soils and groundwater are, currently, the largest category in terms of practical applicability. - Chemical methods are applied to destruction, separation, neutralizing or transforming of pollutants as a result of specific chemical reactions. - Thermo methods have the principle of the heat extraction, destruction or immobilization of pollutants by facing the contaminated material to high temperatures. - Biological methods are based mainly on the degradation of pollutants due to the activity of microorganisms (bacteria, fungus, etc.).

Keywords: pollution, historical contaminated sites,

1. INTRODUCTION

It is estimated that pollution caused by waste and inorganic waste (minerals, inorganic materials, metals, salts, acids, bases) from industry (including mining) affects approximately 560 ha of the total area of our country, most areas are located in those counties where the mining and ferrous and nonferrous industries are highly developed (Galati - 177 ha, Maramures - 103 ha, Suceava

- 106 ha, etc.).[2] The total area affected is estimated at over 4,000 hectares.

Inventories of soil pollution in Romania (conducted before 1989) showed that 900,000 hectares were affected differently by various types of pollutants. After 1989 there was a reduction of some types of pollution, due to either lower quantities of fertilizers and pesticides applied noxious emission reduction or closure of industrial units and agricultural. The main types of soil pollution are:
- Soil pollution (degradation) due to mining

activities;

- Pollution caused by tailings ponds, waste dumps, landfills inconsistent;
- Pollution from wastes and inorganic wastes (fertilizers, inorganic materials, metals, salts, acids, bases);
- Pollution caused by substances carried by air
- (hydrocarbons, ethylene, ammonia, sulfur dioxide, chlorides, fluorides, nitrogen oxides, lead compounds, etc.)
- Salted water pollution caused by oil industry, oil pollution.

Soil should be used in a sustainable manner that would preserve the ability to provide ecological services, economic and social, while maintaining its functions so as to be able to meet the needs of future generations. Contaminated soils are those soils contaminated with chemicals, radioactive, biological and micro-organisms, also with industrial and domestic waste in amounts which adversely affect the health, environment. Soil protection is a complex of measures, carried out by central public administration authorities, local authorities, individuals and legal persons, aimed at preventing and combating soil degradation and pollution, and restoring degraded soils and polluted. The article wishes to present a methodology that is able:

- to guide and accelerate decision making, analyzing economic and environmental benefits
- to aim at re-use of polluted soil, transforming them into foundation soils
- to determine the new technical and scientific resources on the recovery of historically contaminated soils.

This proposal presents a useful method, which help landowners to choose in planning activities polluted and the clean-up projects, with specific characteristics of land reuse. Community environmental policy objectives are, in particular, conservation, protection and improvement of the environment, protect human health and the prudent and rational utilization of natural resources. This policy is based on the principles of preventive action to be taken, that environmental damage should be

remedied as a priority at source and that the polluter should pay.

In this context transposing EU legislation on waste has brought specific responsibility for environmental authorities to implement and enforce this legislation transposed. Due to important economic activities in the past often linked to low importance given to environmental issues, followed by cessation of the activities of industrial giants, Romania inherited a large number of sites contaminated with high levels of emissions to air and water and in many cases leading to an extensive degradation of soil and environment. Most of these sites are abandoned and have no use, and they are at present a risk to the environment and public health.

Previous measurements of soil pollution assessment in Romania showed that different types of pollutants at different levels of pollution have affected about 900,000 ha. Overall, after 1989 was recorded a decrease in certain types of pollution by reducing use of fertilizers and pesticides, emissions of NO_x or closure of certain industrial and agricultural economic units.

Regarding the historical soil pollution, were discovered new types / quantities of potentially polluting substances and elements with an additional activity monitoring conducted by the National Institute of Soil Science and Agrochemistry (ICPA) of the first level of National Monitoring System (16 x 16 km). The most important types of soil pollution investigated by ICPA are:

- Pollution (degradation) of soil through mining activities and extraction from mining careers;
- Pollution caused by the settling basins of hydropower plants, mining wells, and by the non-compliant waste landfills;
- Pollution from inorganic residues and waste (minerals, inorganic materials, metals, salts, acids, bases);
- Pollution caused by substances in the air - hydrocarbons, ammonia, sulfur dioxide, chlorides, fluorides, nitrogen oxides, lead compounds;
- Pollution caused by brine (salt solution) from

oil extraction, transport / distribution and processing.

POTENTIAL USERS OF THE PROPOSED METHODOLOGY:

public administrations and industrial companies that own contaminated land, other research institutes, universities, etc.

At international level for a long time, this is an area of interest to improve economy and achieve sustainable development by identifying ways of rehabilitation and recovery of such lands. Such strategies and guidelines have been developed in order to support all key stakeholders, research institutes, universities, responsible ministries.

In our country this area is still in its infancy, although the legislation requires specific technologies to rehabilitate polluted lands and further use of them, due to low economic development and the knowledge of criteria for risk analysis and environmental impact caused by these soils.

Moreover, local authorities, law enforcement agencies and regional and sectoral development plans, research and development institutions, universities and private enterprises should actively participate and in close collaboration in order to solve problems generated by these polluted soils.

Among other things, support given to industries and the competent authorities to find technologies and methods for decontamination of polluted soils, is to identify those lands as a result of the evaluation methodology and analysis of physical, chemical by laboratory tests in different environments and parameters geotechnical specific.

2. MEASURABLE OBJECTIVES[1]

- Identify system in contaminated areas. Develop a methodology that defines key stages to take appropriate decisions in the process of remediation
- Presentation of laboratory expertise.

Modeling efficiency of remediation methods;
• Ensure compliance with legal regulations on soil quality and the risks involved in protecting the environment and human health. Develop reference guide for assessing risk and choosing the best solution to remedy.

3. EXPLANATION OF CONFORMITY GOALS PROPOSED PROGRAM OBJECTIVES AND PRIORITIES OF THE PROGRAM

The objectives of this project are:
- To develop a methodology that define key stages to take appropriate decisions in the process of remediation

- Presentation of laboratory expertise and facilities to ensure transfer of technology on business issues from land remediation and recovery and reuse of soils

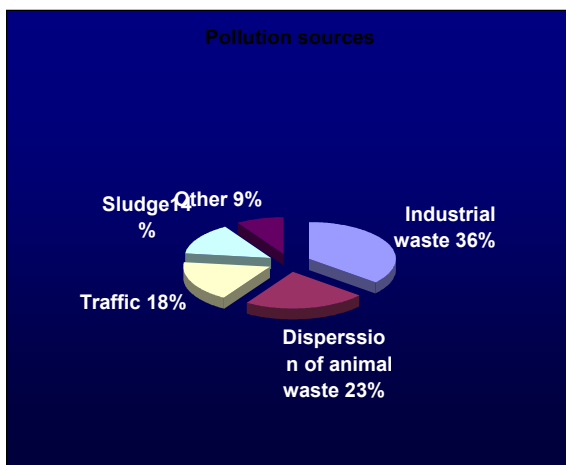
- Ensuring compliance with legal regulations on land quality by protecting the environment and human health

A polluted soil will never regain its previous state so that better not to pollute than to depollute a contaminated land. The more we will take into account and we react, the better we can master our future and we will keep the beauty and diversity of our planet.

Soil is a fragile environment because it is the support upon all human activities (habitat, agriculture, transport, etc.). It is essential for human beings, animals and vegetation.

This project aims to provide a reference guide to authorities, technical consultants, research centers and universities that are interested and involved in the "industrial ecology", essentially facilitating the process of recovery of such materials. Be considered as basic principles in waste management the following: reduction at source, reuse and recycling.

Pollution can come from diffuse sources (dispersed) or point pollution sources, which is localized and concentrated. Pollutants of soils are extremely variable and depend on the origin of pollution.



The presence of a pollutant in soil is not dangerous in itself. We speak of a risk of pollution when pollutants can interfere with the environment: fauna, flora and humans. In order to speak of danger, three (3) conditions must be met:

- Source: the pollutant
- Vector: a plant
- Target: man, community, etc.

Soil quality assessment is necessary for its characterization and involves the following:

-describe the process that caused soil pollution, -sampling

-recommended analysis method -preparation of samples,

-laboratory analyzes (granulometry, alteration, neutralizing capacity, TOC - total organic carbon, the sulfur-acidification potential, content of heavy metals in water, etc.),

-monitoring of variability of the characteristics of the lands to establish a control program. For example, contaminated mining areas suffer from systematic practice. The activity of bringing stones to the surface mining which oxidizes releasing sulfur which in turn is oxidized to produce sulfate. This reaction produces acids that release heavy metals naturally present in soil. These metals, by difusing will pollute the surrounding soil. Remediation of contaminated soils without human intervention, takes several hundred years.

To fix a polluted area, there are several steps to follow:

- Emergency measures (reduce immediate danger)
- Diagnosis: geological and hydrological studies, history of activities within the area, mapping and analysis
- Risk assessment
- Determination of objectives and methods for remediation
- remediation works
- Monitoring and restrictions on land use.

4. SOILS REMEDIATION METHODS

Remediation methods include the entire range of healing techniques, designed to neutralize or block the flow of nuisance caused by pollution.[3]

The classification of these methods can be made depending on the application site in relation to site pollutant, and depending on the technical principles of remediation.

• Classification based on the criterion of the application site

- **Methods applied outside the site** consisting of release of the soil from its natural environment (by excavation), its transportation out of site and execution of remediation works in specialized centers.

- **Methods applied on the contaminated site** - consist of evacuation of the polluted soil from its natural environment, but the contaminated products are no longer transported outside the site, but are treated on site, using mobile remediation installations.

- **Methods applied "in situ"** have as particularity, the execution of remediation works directly in the polluted environment, without using excavation works.

• Classification according to the technical principles of remediation

- **Physical methods** for remediation of soils and groundwater are, currently, the largest category in terms of practical applicability.

- **Chemical methods** are applied to destruction, separation, neutralizing or transforming of pollutants as a result of specific chemical reactions.

- **Thermo methods** have the principle of the heat extraction, destruction or immobilization

of pollutants by facing the contaminated material to high temperatures.

- **Biological methods** are based mainly on the degradation of pollutants due to the activity of microorganisms (bacteria, fungus, etc.).

5. CONCLUSIONS

This paper proposes a methodology of investigation in order to establish the possibilities of recovery of historically contaminated lands and after to be used as construction materials in geotechnical and foundations.

Theme capitalization of land contaminated from industry responds to the demands of national and waste management strategy by promoting the principle of the 3 R (Reduce, Reuse and Recycle) in accordance with national legislation and European directives on waste management.[4]

Limits can occur in implementation of the project because most lands often contain

elements besides their availabilities and these elements can produce contamination, thus reducing their potential for recovery.

A polluted land can not be reliably use due to the complexity and difficulties in remediation or because there is not yet possible to identify a market for this product.

6. REFERENCES

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