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**Specific Target Research Project**

Thematic Priority – C1 Environment

# **RECOAL**

## **Reintegration of Coal Ash Disposal Sites and Mitigation of Pollution in The West Balkan Area**

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### **Publishable Executive Summary reporting period 2005**

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# Publishable executive summary

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## Abstract

Large areas of the **West Balkan region** are affected by coal ash deposits. Due to heavy metal contamination of this ash, water resources like groundwater are affected in the surrounding area by polluted effluents. Release of drainage waters from coal ash deposits contaminate water pollution to big areas in the region. Heavy metals entering the food chain and dust dispersion by wind erosion may negatively affect the health of local people.

The aim of the **RECOAL project** is to develop and test new and innovative methods for **remediation** of **coal ash deposits** and affected **water resources**. Conventional and new, low-cost technologies are being evaluated for their potential to clean-up contaminated water bodies and effluents from deposits. Immobilisation of heavy metals using various amendments and establishment of a soil cover to reduce the transfer of toxic metals to groundwater and to air is being tested. Crops with low metal uptake rates will be selected to allow safe agriculture on remediated coal ash sites. Landscape planning techniques will be applied for reintegration of disposal sites into sustainable land use. The technologies to be used in this project are being tested under laboratory conditions and at field scale evaluated.

Special emphasis is put on **socio-economic aspects** related to the problem and its remediation. **Local people are being involved** throughout the whole project duration. The results will be used to compile decision tools, which will be published in a handbook to be provided to local authorities, stakeholders and problem owners.

## Keywords

Pollution, coal ash, thermoelectric power plant, West Balkan, remediation, phytostabilisation, agriculture, food chain, alkaline waste, heavy metals, water pollution.



**Figure 1.** The thermo-electric power plant in Tuzla, pipelines for wet deposition of coal ash and an ash profile on a recently abandoned coal ash deposit.

## **Introduction**

The combustion of enormous quantities of coal for energy production is closely related to the production of large amounts of waste materials like ashes and cinders, which are typically pumped with water into large, dammed disposal sites (wet deposition). In some regions in the West Balkan disposal sites cover a prominent proportion of the land's surface, eg. about 10% around Tuzla (Bosnia-Herzegovina).

The consortium of the RECOAL project aims to establish the scientific and technical basis for the environmentally-sound and cost-effective reintegration of coal ash dumping sites. Working packages that integrate safe agricultural use with technology that mitigates off-site pollution due to leaching of alkaline, toxic seepage, water erosion and re-suspension of toxic dust are being developed and tested at bench and field scale. Solutions being tested within the RECOAL-project include emerging low-cost technologies such as phytostabilisation and possibly a constructed wet land to clean up effluents, landscaping measures (buffer strips, wind belts) to reduce dust dispersion, a selection of low-metal uptake crop varieties and the use of inexpensive soil amendments and soil cover in order to control nutrient and pollutant transfer to crops and the food chain and to support phytostabilisation of barren ash deposits.

## **General project Objectives**

- Providing the scientific and technological basis for safe re-integration of ash dump sites in the West Balkan area using a combination of agronomic, ecological, soil technological and socio-economic approaches.
- Providing solutions for the protection of the food chain using low-pollutant uptake varieties of local crops combined with soil cover and soil amendments. Overall, this will result in technology packages integrating agronomic and soil technical measures and landscaping. Measurable outputs include the partial remediation of two field sites where the feasibility of the approach will be tested and demonstrated.
- Providing low-cost solutions for dust reduction by integrating measures of landscaping (buffer strips, wind belts), crop selection and crop rotation / inter-cropping (to provide permanent vegetation cover). Results and the feasibility of their implementation will also be demonstrated on two field sites.
- Providing innovative low-cost solutions for reducing pollution of local rivers from dump site effluents, using novel soil filter – phytoextraction and rhizo-filtration / chemical fixation technologies. Measurable results will include reporting and publication in high-level refereed journals and books on the scientific and technical solutions obtained, including the evaluation of the results of bench scale and field experiments.
- Developing these technology packages in partnership with end users (farmers, municipalities), problem holders (power plant companies) and stakeholders / policy makers in the West Balkan area, as part of the socio-economic work of the project. Measurable outputs will include a series of focus groups and interviews

with local stakeholders at the problem definition stage. Two demonstration sites will be established and used as the basis for seminars to be held towards the end of the project. The results will be published in the form of guidelines / handbooks in the local languages targeting practitioners, and in addition, all innovative aspects of the project will be published (in English) in high level scientific periodicals and books.

- Fostering collaboration among countries and various ethnic groups in the West Balkan area and mediating the dialogue between local inhabitants, including refugees, and municipalities as well as power plant companies. Measurable outputs will include the organisation of joint workshops and seminars by the West Balkan participants during and after the project.

## Work performed and results achieved during the first year

It is well known from scientific literature that the coal ash may contain a large number of potentially toxic elements like As, B, Cd, Cs, Cr, Ni, Pb, U, Zn etc. (Carlson and Adriano, 1993). However, virtually nothing has been known about pollutants occurring in the ash bodies of Tuzla. Therefore the RECOAL consortium conducted first an environmental risk assessment and in-depth studies on related social aspects of the research area.

Wet deposition of coal ash has started about 40 years ago. Since then associated problems like wind dispersion and water contamination have been ever increasing. Two disposal sites had been covered with top soil in the early 1990s to prevent wind erosion. However, this remediation measure caused another problem. Local people have been using the covered disposal sites for agricultural production. Soil tillage resulted in mixing of the top soil into the ash body (Figure 2a) inevitably resulting in contamination of the food chain. Large quantities of drainage water from disposal sites are released into the local river Jala (Figure 2b).



(a)



(b)

**Figure 2.** Agricultural production on abandoned ash disposal sites **(a)** Dreznik and **(b)** and Plane.

A number of potentially toxic elements were detected in coal ash, plants and effluent water from disposal sites. Additionally it was found that effluent water is highly alkaline. A series of bench scale and green house experiments was conducted, some of which are being continued.

Using the data generated in the context of the risk assessment, RECOAL partners started to develop cost-effective solutions for the reintegration and mitigation of pollution derived from the Tuzla coal ash deposits.

Based on mind-mapping techniques and in-depth discussion, a holistic picture of the major requirements and priorities was developed which integrates the technical and socio-economic perspectives of the problems associated with coal ash disposal in the Tuzla region.

The RECOAL consortium has decided to continue risk assessment also in 2006 to enhance our data basis. For example, effluent water quality might show seasonal variations. Additionally, more private tube wells will be analysed.

## **Expected results and impact**

The aim of this project is to develop effective, low-cost and sustainable solutions for the environmental and economic problems associated with coal ash disposal sites in the West Balkan region.

Additionally, this project will also help to re-establish scientific excellence, initiate close co-operation with partners from EU countries, and also initiate intensive collaboration between the countries of West Balkan area.

The co-operation between groups of different ethnic and religious background in the West Balkan area within this project will contribute to an initiation of future collaboration in the region, which is directly relevant to EU policies towards a peaceful, economically, socially and ecologically stable development in Europe.

The success of research and development projects such as RECOAL can be enhanced through effective participation of stakeholders. Therefore special emphasis is put to the socio-economic aspects of the suggested measures being developed within the RECOAL consortium.

Publication of scientific articles and the compilation of the handbook will help to distribute results, decision tools and proposed standards.

Within the first year the project has raised interest and support among all stakeholders. Where conflicts about the coal ash disposal sites have arisen, RECOAL offers opportunities for conflict resolution. The stakeholder analysis has revealed the importance of ensuring the effective participation of local communities and the

municipal authorities. However, major issues arise regarding the involvement of local communities. There is a need for a much better understanding of their perceptions of the pollution problems and potential solutions.

## **RECOAL consortium members**

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