

RECOAL: Reintegration of coal ash disposal sites and mitigation of pollution in the West Balkan area -

Much of the West Balkan region uses coal as its primary fuel, resulting in large areas being used for coal ash deposits. Pollutants present in the ash can contaminate water resources and soil, and enter the food chain. Also, dispersion of ash dust by wind may negatively affect the biota and the health and well-being of local people. The European Commission funded RECOAL project assessed low-cost methods for the remediation of coal ash deposits and affected water resources. An international consortium of researchers took part with an industrial partner. The team considered hydrological, physico-chemical, socio-cultural, economic and institutional aspects to elicit specific pollution issues and to develop and evaluate potential remediation proposals.



Courtesy W. Fitz

“Once, when the times were good, when industry wasn’t so developed, especially the ‘dirty’ industry [...] everything used to grow here. Watermelons, fruit, vegetables... However, for the last 10 or 15 years, almost nothing grows here. And if anything grows, it is dangerous to consume.”

Tuzla resident

Background

Using a case study approach, the project focused its research on the thermo-electric plant (TEP) and associated coal ash sites at Tuzla, Bosnia and Herzegovina. TEP Tuzla is the largest power plant in the country. Wet disposal techniques are used, which have a higher environmental and social impact than dry disposal. The area of ash disposal extends to over 173 ha, transforming the landscape and significantly affecting ecosystems, daily life (e.g. dust dispersion during the dry summer months) and health conditions in the surrounding communities. Research on water quality, crop varieties and soil and ash amendments was conducted in both laboratory conditions and also at the field scale. Field studies were carried out mainly in Tuzla, however other sites in the Western Balkans were also sampled for comparison. Part of RECOAL’s remit was to consider social and economic aspects of the pollution problem and its remediation.

Objectives

RECOAL’s overarching objective was to develop the scientific and technological basis to inform decision making for the safe re-integration of coal ash disposal sites in the West Balkans.

RECOAL’s work programme (2005–2007) aimed to:

- test crop varieties to identify those with a low-pollutant uptake, and provide advice on crop management and landscaping measures to reduce pollution impacts

- provide innovative low-cost solutions for cleaning up effluents and improving water quality
- identify local stakeholders and develop and evaluate RECOAL’s remediation solutions in partnership with end users (farmers, municipalities), problem holders (power plant companies), other stakeholders and policy makers
- develop decision tools to help regulate and manage coal ash disposal sites

Methods

The project used a combination of agronomic, ecological, hydrological, soil technological and socio-economic approaches. Forest Research led the social science component, including:

- initial stakeholder analysis
- impact assessment and evaluation of different remediation options
- development of decision support tools for use by local governance stakeholders

Work under an affiliated Engineering Doctorate took a social constructionist approach to elicit and analyse different perspectives on coal ash pollution amongst different stakeholders (local residents, local- and regional-level government institutions and project team members).

Findings

RECOAL contributed data and knowledge to highlight certain risks and aspects of the coal ash disposal sites and scoped potential low-cost management solutions.

Pollution:

- The high alkalinity of ash transport and disposal site discharge water (pH 10–12) and its increased electrical conductivity affect the solubility and reaction potential of pollutants present in the coal ash.
- Several pollutants (arsenic, boron, chromium and, in some cases, cadmium) were in some instances elevated or above regulatory threshold levels.
- There were noticeable differences in the pollutant uptake between different crops and cultivars. Beans were most affected, whereas barley varieties appeared to be more tolerant of pollution.

- Agricultural and pastoral use of the coal ash deposit sites, at least in the first 20 years or so, could pose significant risk of transferring pollutants into the human food chain.

Potential remediation solutions:

- A step-aeration system in combination with different types of sorbent materials may help reduce water pollutant levels by 50% or more.
- Applying ash amendments (unpolluted organic materials) can help to quickly establish a vegetation cover to prevent the dispersion of coal ash dust.
- Greenspace and tree cover was favoured by several interviewees as providing multiple social and health benefits.
- Many local residents highlighted other socio-economic factors (e.g. unemployment, lack of social services) that compound the negative impacts of pollution.

Recommendations

While RECOAL provided information on suitable remediation components, the pollution problem was recognised as being more complex and varied than originally anticipated. Furthermore, research amongst different stakeholders highlighted the existence of different perspectives on the pollution problem and how this resulted in different demands being placed on the research project. Several insights for change were gained, including the following recommendations.

Research – society:

- Project framing could be improved by scoping the research needs and different pollution perspectives among local stakeholders *before* a project starts. This may require pre-project funding mechanisms for applied research projects.
- Some local concerns (e.g. about radioactivity) cannot be alleviated by communicating risk assessment results (e.g. that tested samples are within ‘normal’ background levels). Greater openness and trust-building between the industry and local residents are needed.
- Local residents have contextual knowledge that can aid the identification of pollutant linkages and the characterisation of its health and environmental impacts. This knowledge may be useful for risk analysis and should be sought from the community.

Science – policy:

- The following criteria were found to be useful and are recommended in appraising remediation options: feasibility, acceptability, cost-effectiveness, safety and long-term sustainability.
- Official signed reports that present research results in an accessible way will have a greater impact than distributing original research deliverables.

Partners

The RECOAL consortium members were: **BOKU** University of Natural Resources and Applied Life Sciences Vienna, Austria (Coordinator); **HEIS** Hydro-Engineering Institute Sarajevo, Bosnia and Herzegovina; **UBAL** University of Banja Luka, Bosnia and Herzegovina; **FAZ** University of Zagreb, Croatia; **BTUC** Brandenburg University of Technology Cottbus, Germany; **FR** Forest Research, Alice Holt Lodge, UK; **TEP** Thermo-electric power plant Tuzla.

For further information contact: claudia.carter@forestry.gsi.gov.uk

Funding/support

The project was supported under the European Union Sixth Framework Programme (Contract number: INCO-WBC-1-509173) with co-funding from the Forestry Commission.

Reports and publications

Handbook of Regeneration Solutions for Coal Ash Disposal Sites in the Western Balkans. (English and Bosnian language versions) available at www.forestresearch.gov.uk/fr/INFD-63KE8Y

- Castán Broto, V., Tabbush, P., Burningham, K., Elghali, L. and Edwards, D. (2007). Coal ash and risk: four social perspectives on a pollution landscape. *Landscape Research*, **32** (4), 481–497.
- Castán Broto, V., Carter, C. and Elghali, L. (2009). Research note: The governance of coal ash pollution in post-socialist times: power and expectations. *Environmental Politics*, **18** (2), 279–286.
- Castán Broto, V., Burningham, K., Elghali, L. and Carter, C. (forthcoming). Stigma and attachment: performance of identity in an environmentally degraded place. *Society and Natural Resources*.
- Dellantonio, A., Fitz, W.J., Custovic, H., Repmann, F., Schneider, B.U., Grünewald, H., Gruber, V., Zgorelec, Z., Zerem, N., Carter, C., Markovic, M., Puschenreiter, M. and Wenzel, W.W. (2008). Environmental risks of farmed and barren alkaline coal ash landfills in Tuzla, Bosnia and Herzegovina. *Environmental Pollution*, **153**, 677–686.