



Acid and metalliferous drainage remediation: Legislative drivers, and research and development activities in Europe

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Introduction

- Acidic drainage is a widespread problem in Europe
 - examples occur from high Arctic to circum-Mediterranean deserts
- Many European examples are associated with abandoned mines. Liable parties often absent, or liabilities unclear
- New European Union legislation raised awareness of problems of mine water pollution



Mining / mine water issues in Europe - examples



Country	Environmental management concerns
Estonia ¹	Groundwater depletion due to dewatering; elevated SO ₄ ²⁻ concentrations
France ²	Contamination of surface / groundwater by mine water rebound; flooding and subsidence
Germany ³	Surface water contamination from tailings, waste rocks and mine voids; rising mine waters
Hungary ⁴	Continued mine water pumping to protect groundwater supplies from products of pyrite oxidation and dissolution
Italy ⁵	Pollution of surface and groundwater, due to rebound, with sulphate and metals. Subsidence / collapse.
Netherlands ⁶	No serious issues as yet. Rising waters continue to be monitored, but believed to be hydrologically isolated from adjacent water supply aquifers
Norway ⁷	Surface water contamination from tailings, waste rocks and mine voids
Poland ⁸	Groundwater and surface water contamination from tailings, waste rocks and mine voids; utilisation of pumped saline mine water
Slovakia ⁹	Impacts on groundwater supplies and contamination of surface waters
United Kingdom ¹⁰	Surface water contamination from long-abandoned mines; groundwater rebound leading to potential aquifer pollution; surface water contamination from waste rock dumps



Legislation

- Directive on the Management of Waste from the Extractive Industries (2006/21/EC)
 - Clarification of mechanisms for management of mining waste
 - Requirements for permits for waste facilities, waste management plans, financial guarantees, EIA etc
- Water Framework Directive (2000/60/EC)
 - 'good chemical and ecological status'
 - management of aquatic systems at river basin scale
 - development of River Basin Management Plans



European Research

- R&D activities in part influenced by legislation, and likely to be more so in coming years
- Some activities specifically targeted at implementation of legislation:
 - Working group addressing production of inventories of closed mine waste facilities (Mining Waste Directive)
 - CEN (European Standardisation Organisation) investigating characterisation of mine waste (Mining Waste Directive)
 - In UK, national prioritisation of metal mines for use in River Basin Management Plans (Water Framework Directive)



European Research (EU FP6 projects)



Source: <http://cordis.europa.eu>

Title	Co-ordinating country / Value
BIOSHALE: Search for a sustainable way of exploiting black shale ores using biotechnologies	France €3.4 million
COSTAR: Coal mine Sites for Targeted Remediation research	UK €470,000
ERMISA: Environmental Regulation of Mine Waters in South America	UK €105,000
REMINING-LOWEX: Redevelopment of European mining areas into sustainable communities by integrating supply and demand side based on low exergy principles	Netherlands €7.2 million
PREWARC: Strategic plan for prevention of regional water resources contamination from mining and metallurgical industries in Western Balkan countries	Greece €10,000
SAFEMANMIN: Safe management of mining waste and waste facilities	Austria €400,000
WATERNORM: Monitoring and mitigation of mine water impact in Upper Silesia region: Increasing research and development potential in Central Mining Institute	Poland €895,000



European Research: National R&D examples

- Catchment scale flux of contaminants from mining areas
- Diffuse pollution from mining areas
- Passive mine water remediation options
- Impacts of metal-rich discharges to the aquatic environment
- Open pit remediation
- Uranium mining remediation
- Hydrogeological studies



PADRE: Partnership for Acid Mine Drainage Remediation in Europe

- A regional 'Commission' of the International Mine Water Association (IMWA)
- Constitution of PADRE derives from IMWA's statutes and Bye-Laws
- Like IMWA, PADRE is a non-governmental, non-profit, scientific and technical organization
- PADRE was established by a decision of the Executive Council of IMWA in October 2003, endorsed by the IMWA General Assembly



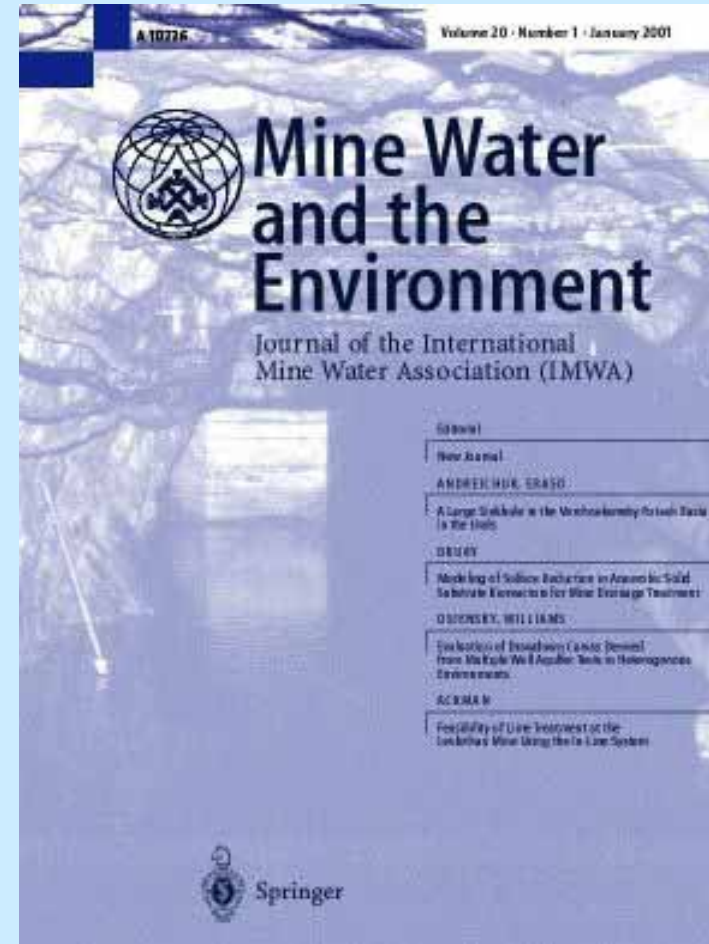
PADRE Objectives

1. Promote international best practice in the stewardship of waters and soils on European sites subject to the generation and migration of acidic drainage.
2. Foster collaborative, international research and development into techniques for characterisation and abatement of acidic drainage in Europe.
3. Promote dissemination of knowledge of current best-practice and innovations relating to acidic drainage prevention and remediation, with particular reference to European conditions, including the evolving framework of relevant EU legislation.
4. Advance the training of present and future generations of European professionals who will engage in the art and science of acidic drainage prevention and remediation.
5. Actively collaborate with a Global Alliance of organisations based in other continents which share similar objectives.



PADRE main dissemination tool

- IMWA Journal
“Mine Water
and the
Environment”





Why PADRE?

- The EU Mine Waste Directive and Water Framework Directive have raised awareness of ARD issues amongst regulators and policy makers
- Numerous acidic drainage investigations are underway, both Europe-wide and national
- A central 'watching post' is desirable in order to avoid unnecessary duplication of effort
- Europe should ensure it is fully engaged with intercontinental initiatives such as the Global Acid Rock Drainage (GARD) Guide



Concluding comments

- Considerable R&D efforts to address significant mine water pollution issues in Europe
- New legislation adding new impetus and direction to these initiatives
- Avoidance of duplication is essential in a competitive market of limited resources
- A central 'repository' for information on R&D activities therefore advisable
- Ensuring European involvement in global initiatives is essential if full range of mining-related ARD issues are to be incorporated in guidance documents such as GARD Guide, and duplication is to be avoided
- PADRE has the objective of achieving this, but its activities in this respect should arguably increase, to provide a resource for use by researchers and industrialists across Europe