



Global Heavy Metal Pollution (AMD / ARD) Impacts

J.R. Taylor

Earth Systems Pty Ltd, Suite 17, 79-83 High Street, Kew, 3101, Victoria, Australia.

Heavy Metal Pollution (AMD/ARD) is the single biggest environmental issue facing the mining industry worldwide. It affects most countries and all mining sectors, including coal, precious and base metal, tin, tungsten, molybdenum, uranium, and rare earth element (REE) mines, as well as industrial mineral deposits (eg. mineral sands, diamonds) and quarries. Heavy Metal Pollution (AMD/ARD) has a combined worldwide economic impact estimated to be in excess of US \$10 billion and impacts can continue for more than 2,000 years.

Social and environmental impacts can affect agricultural productivity, food security, water resources (ie. drinking, irrigation, livestock, fishing, recreation, tourism), human health, aquatic ecosystems, and cause loss of habitat and community displacement and outrage. Economic and business impacts include accumulating liabilities for governments and mining companies, expensive remediation programs, increasing compensation payments and impacts on company reputation and future project approvals. In 2009, across the world more than 100 organisations managing mine sites had formally committed to the treatment of heavy metal pollution (AMD/ARD) in perpetuity (300+ years).

Acidity flux rates from mine sites, measured in tonnes of sulphuric acid (H_2SO_4) per day, provide a simple measure of the scale of heavy metal pollution (AMD/ARD) impacts from mining operations worldwide. The following daily acidity flux rates have been estimated or measured from various high profile mine sites in the USA and Australia.

- Iron Mountain, California, USA (20-40 tonnes of H_2SO_4 /day)
- Berkley Pit, Montana, USA (30-50 tonnes of H_2SO_4 /day)
- Bingham Canyon, Utah, USA (~20 tonnes of H_2SO_4 /day)
- Mt Lyell, Tasmania, Australia (80 tonnes of H_2SO_4 /day)
- Mt Morgan, Queensland, Australia (20 tonnes of H_2SO_4 /day)
- Brukunga, South Australia, Australia (2 tonnes of H_2SO_4 /day)

Key conclusions from an assessment of global heavy metal pollution (AMD/ARD) impacts include:

- Impacts from heavy metal pollution (AMD/ARD) are increasing globally as large tonnage-low grade deposits are increasingly exploited and mining expands with population growth.
- Key steps in heavy metal pollution (AMD/ARD) management include geochemical characterisation and classification, the subsequent development of waste disposal strategies for different materials, and finally ongoing

monitoring.

- Forward planning for new mines is vital and has the potential to prevent heavy metal pollution (AMD/ARD) from future operations.
- New waste rock dump construction methods and tailings management methods are beginning to be applied to successfully lower the impacts of heavy metal pollution (AMD/ARD).
- New technologies are emerging to assist with the management of heavy metal pollution (AMD/ARD) from existing and historic sites. Such technologies include tailings-waste rock co-disposal (often saturated), alkalinity producing covers and secondary mineral engineering strategies.
- While water treatment can solve most problems during operations, it is vital to avoid the need to treat water in perpetuity.