Global Environmental Impacts of Historic and Contemporary Mining

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Mining has been, and still is, an essential part of the global economy, but it produces enormous quantities of waste. The surface footprint of mine wastes is considerable, as enormous quantities of solids and liquids are stored near mine sites [1]. Solid wastes can be dispersed by wind as dust, or by rivers, causing increased alluviation, while liquid wastes can pollute surface and ground waters. Mine wastes contain contaminants (e.g., arsenic, lead) in concentrations that pose serious hazards to ecosystem and human health. They also contain elements such as iron and sulfur, which are involved in many natural geological processes (mineral precipitation, acidification). A number of mine waste elements (copper, selenium) are micro-nutrients in the oceans, rivers and soils but are toxic if their concentrations exceed critical thresholds [2]. It has been estimated that the annual production of solid mine wastes - at several thousand million tonnes per year - matches the amount of Earth materials moved by natural processes [3]. The amounts of mine wastes are increasing globally because of growing demand for metals and the exploitation of lower grade ores with higher waste to ore ratios [4], but historical mine wastes have equal or greater environmental impacts due to the lack of legislation, less efficient processing and the use of toxic components (e.g. mercury) to recover ores [5]. This presentation will review current knowledge of the global environmental and human health impacts of historic and contemporary mining, highlighting new developments on the global mapping of mine waste sources, sinks and fluxes, the micro- to nano-scale characterisation of mine waste waters, sediments and dusts and the potential health effects of mine wastes on humans and ecosystems.

[1] Hudson-Edwards et al. (2011) *Elements* **7**, 375-380. [2] Rauch & Pacyna (2009) *Global Biogeochem. Cycles* DOI 10.1029.2008GB00376. [3] Fyfe (1981) *Science* **213**, 105. [4] Mason et al. (2010) *J. Cleaner Prod.* **19**, 958-966. [5] Cooke et al. (2011) *Ambio* **40**, 18-25.