

Mercury contaminated sites in the context of global mercury cycle

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Mercury is a contaminant of a global relevance, which is evidenced from a new global mercury treaty “Minamata Convention”, adopted in 2013. The main objectives of this convention are to protect human and ecosystem health from adverse effects of this toxic metal by reducing the emissions to air and releases to aquatic environment. Several articles within this convention address these issues including the reduction of emissions from stationary sources; limit the use of mercury in products and processes; closure of the primary mercury mining; permanent and safe storage of surplus liquid mercury and appropriate handling of wastes containing high concentrations of mercury. Remediation of mercury-contaminated sites are also addressed by the convention. Due to the unique chemical and physical properties, mercury cycles between environmental compartments (soil, water, air, and biosphere) and can reach places far away from sources of emissions. Global mercury emission inventories include anthropogenic emissions, contributing via current use or presence of mercury in a variety of products and processes, as well as natural source emissions. These inventories neglect the contribution of areas contaminated with mercury from historical accumulation, which surround mines or production plants associated with mercury production or use. Although recent studies have shown that releases of mercury from these historical sites can be significant, a database of the global distribution of mercury-contaminated sites does not exist, nor are there means of scaling up such releases to estimate fluxes on a regional and global basis. Therefore, an effort was made to estimate the contribution of mercury releases from contaminated sites to the global mercury budget. A geo-referenced database was built, comprising over 3000 mercury contaminated sites associated with mercury mining, precious metal processing, non-ferrous metal production and various polluted industrial sites. In the assessment, mercury releases from these sites to both the atmosphere as well as the hydrosphere were considered based on data available for selected case studies, their number, the reported extent of contamination and geographical location. Annual average global emissions of mercury from identified contaminated sites account for about 3-5 % of the global mercury released to the aquatic environment and up to 5 % to the atmosphere. Although these estimates are associated with large uncertainties, our current understanding of mercury releases from contaminated sites indicates that these releases can also be of paramount importance on the global perspective. This is especially important, as it is known that these sites represent a long-term source of releases if not managed properly. Therefore, it is important to re-focus resources in making decisions regarding mitigation and remediation strategies of mercury-contaminated sites on a global level.