Trace Element Concentrations in Soil, Sediments, and Waters in the Vicinity of Geita Gold Mines and North Mara Gold Mines in Northwest Tanzania

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The "Geita Gold Mine" (GGM) and "North Mara Gold Mines" (NMGM) have devel- oped large quarries in the middle of fertile agricultural lands. Possible hazardous impact on the natural recourse has warranted a study on the trace element concentrations in soils, sediments, and natural waters. Generally, the study shows a great variation in type of elements and intensity of their spill to soils, sediments, and waters. We found indications of acid mine drainage (AMD) of trace metals near the GGM waste rock tailings, but the data are inconclusive. The environmental impact at NMGM was, on the other hand, more extensive. Severe trace element contamination of sediments and waters near one of the mining facilities managed by NMGM is connected to an accidental acid spill in 2009. However, we found strong indication that, in addition to the accident, leakage of alkaline wastewater into surface soils and free water took place from a large wastewater reservoir. We found very high concentrations, especially of As in sediments and water samples downside this reservoir. Water from several sites contained As con- centration in the free water at more than one order of magnitude higher than the WHO drinking water recommendations. The chemical speciation of water samples indicated high fraction of Free Ion Activity (FIA) in several samples and the change in pH had a significant impact on the FIA. Due to extensive alkaline and acidic runoff from these sites, more information about hydrological transport routes and the chemical speciation of the free water is of great importance for assessing potential risk of these mines.

Keywords Tanzania, gold mining, surface water, arsenic, WHO, speciation