SUMMARY OF THE STUDY: Impact on Regional Water Quality of the Rio Tinto QMM Ilmenite Mine, Southeastern Madagascar, by Dr Steven Emerman (Nov 2019) for the Andrew Lees Trust

The Rio Tinto QMM ilmenite mine on the coast of southeastern Madagascar extracts ilmenite from mineral sands, thus concentrating monazite in the remaining mine tailings that are deposited into mining basins. Monazite is enriched in the radioactive elements uranium and thorium, as well as lead, which is the decay product of uranium and thorium. As a consequence, the water in the mining basins becomes progressively enriched in uranium, thorium and lead. This mine process water is released into a wetland adjacent to a river, while additional water enriched in uranium, thorium and lead enters adjacent lakes through groundwater seepage from the mining basins. Surface water is the primary source of drinking water for the 15,000 people who live near the mine site. According to data collected by the QMM mine at two upstream and 10 downstream surface water sites, 37% and 43% of samples exceed World Health Organization (WHO) drinking-water guidelines for uranium and lead, respectively. Lead impedes physical and mental development in children and causes kidney problems and high blood pressure in adults. Uranium causes an increase in the risk of cancer, as well as kidney toxicity. Thorium by itself has no chemical toxicity, but is an element of concern due to its production of alpha and beta particles and photon emitters, which do lead to increased risk of cancer.

The lack of upstream sites (only one, zero and three measurements above a detection limit for uranium, thorium and lead, respectively) made it difficult to separate the impact of the mine from the natural background. Moreover, each water-quality parameter inexplicably had two detection limits (uranium measurements were reported as <0.642 mg/L and <0.047 mg/L), both of which were unrealistically high, and which brought into question the validity of the entire QMM dataset. Local residents collected nine additional surface water samples, including five upstream and four downstream samples, which were analyzed for 46 elements and isotopes at the University of Utah. Two of the upstream samples were outside of the watershed of the QMM mine, but were not downstream from any mineral sands mining. The direct comparison of the QMM and the new datasets was hampered by the lack of spatial overlap of the sample sites, but was somewhat facilitated by their occurrence in the same geologic units. One of the new sites was close to two QMM sites, at which the QMM mine reported measurements of only iron and lead above a detection limit. Since iron concentrations were the same order of magnitude for the two datasets, it was decided that the QMM dataset could not be rejected. For comparison of upstream and downstream concentrations, the two datasets were integrated by removing all QMM measurements that were below the detection limit.

The negative impact of the mine on regional water quality is indicated by the increases in uranium, thorium and lead in surface water from the upstream to the downstream side of the mine. These increases were sufficiently large that there was better than 99% confidence that they could not have occurred by chance. The response of Rio Tinto has been that “care must be taken when comparing to conservative guidelines such as the WHO Drinking Water Guidelines.” It is recommended that Rio Tinto take immediate action to provide safe drinking water for the local residents.

Access the full study here: http://www.andrewleestrust.org/blog/wp-content/uploads/2019/12/ALT_Water_Quality_Report_Emerman_Revised-2019.pdf

