

# **Risk Assessment of Uranium in Selected Gold Mining Areas in South Africa.**

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Due to the nature of the debates surrounding issues of contamination by radionuclides, it is critical to present results of such investigations carefully in a neutral format. The format for reporting in the current study was that of a Tier-II risk assessment, as routinely implemented by the US EPA.

The Wonderfontein valley is densely populated because of its agricultural value and presence of gold mines. It contains the town of Potchefstroom with more than 400,000 inhabitants. A large proportion of the inhabitants of the catchment live in informal settlements, using contaminated ground- and stream water for personal hygiene and drinking. With above-average infection rates of HIV/AIDS and chronic and acute malnutrition, this subpopulation is particularly vulnerable to additional stress of the immune system by contaminants such as uranium.

The integration of sources, releases, fate-and-transport mechanisms, exposure points and exposure routes into complete exposure pathways was performed. Principal modes of contact are ingestion of water and food products, and inhalation of dust and aerosols.

For the risk assessment, the analytical results were compared with a compilation of regulatory limits, exclusion limits and guidelines for contaminant levels in sediments, as well as the global mean values for similar sediments in the geological record. The mean values for the Wonderfontein samples were found to significantly exceed not only natural background concentrations, but also levels of regulatory concern for uranium.

The uranium risk coefficients derived in this study are presented and explained. The risk based on toxicological information pertaining to the chemical toxicity of uranium exceeds the radiological risk of uranium to the inhabitants of the Wonderfontein catchment.