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Management of mine water and AMD challenges using river water catchment area and Geo-environmental provinces approach, South Africa

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A national project was conducted aimed at assessing, mapping, and ranking of mine-polluted areas with the view to rehabilitation / remediation in a systematic and holistic manner.

The investigation has been undertaken on a catchment-by-catchment approach prioritized on the basis of geo-environmental provinces. The impact due to mining most severely affects the water resources of the country, the magnitude and severity of which ultimately dictate the well-being of the other environmental sub-systems such as the fauna and flora ecosystems. Mine pollution hotspots were identified and ranked using a multi-disciplinary pollution assessment approach based on water and sediment geochemistry, hydrology, hydrogeology, the current and potential status of acid mine drainage of mining infrastructures, ecotoxicology, remote sensing, and geophysics.

Using this approach, a number of pollution hotspots and associated pathways and pollution sources have been identified and presented in the form of catchment-scale pollution maps for eight primary river catchment areas which cover almost all of the geo-environmental provinces of the country. This in turn was compiled to generate a national mine pollution atlas for the country. Based on the ranking of the hotspots, pilot-scale restorative projects are currently being undertaken.

The methods and results of the multi-disciplinary catchment-scale mine pollution mapping conducted in the Olifants and Inkomati-Crocodile primary river catchments will be presented briefly in this paper to demonstrate the effectiveness of the approach.

The results of this study demonstrate the benefits of a multi-disciplinary approach for the assessment and ranking of mine pollution hotspots, and its potential use in identifying pollution sources faster and cheaper than the conventional mine area approach, especially for large catchments where mining activities are widespread, are of heterogeneous commodities, and where there are many decades of mine legacy.

