

An Evaluation of the Effects of Historical Coal Mining Activities on Water Quality in the Elitheni Colliery, Eastern Cape Province, South Africa

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The study reported on here was conducted to assess the impacts of historic coal mining activities at Elitheni Colliery in South Africa. Five boreholes and five water ponds were sampled during the summer of 2010 and winter of 2011. Physical characteristics (pH, EC, TDS) and hydrochemical characteristics (Na^+ , K^+ , Ca^{2+} , Mg^{2+} , HCO_3^- , Cl^- , SO_4^{2-} , F^- , Pb and Fe) of the water were determined. To assess the suitability of the water for irrigation purposes, parameters such as total hardness, sodium absorption ratio (SAR), percentage sodium (% Na), residual sodium carbonate (RSC), permeability index (PI) and Mg ratio were calculated. The pH of the water ranged from 6.87 to 8.91, and electrical conductivity (EC) was between 4.5 and 94 mS/m. Total dissolved solids (TDS) ranged from 178 to 470 mg/L; spatial variations in TDS attest to variations in lithological composition, activities and prevailing hydrological regimes. HCO_3^- and SO_4^{2-} were the dominant anions, while Na^+ was the dominant cation. Na-K-SO_4 and Na-HCO_3 were the dominant hydrochemical facies. Fe content was high in borehole water due to the oxidation of pyrite. On the basis of the calculated SAR, % Na, RSC, Mg ratio and salt content, it was concluded that the water can be used for irrigation purposes. The water quality analysis provided no conclusive evidence that historical mining activities have had any significant impact on the acidification of water resources in Elitheni Colliery. However, further studies are required to ascertain the ability of the aquatic environment and surrounding rocks to buffer any acid generated.

Keywords: Molteno-Indwe Coalfield, Acid mine drainage, Geochemical characteristics, Water quality

Biography:

Lindani Ncube is a geologist who holds a PhD in geology. Her professional background encompasses: Geology; geological field mapping, core logging, coal and sediments sampling, exploration project development and scoping, implementation of logging standards and sampling protocols, implementation of best practice mineral resources management, building of geological block models and utilizing own software, reporting resources, geological feasibility studies, determination of grade profile and the development of product grade control systems, management of all geological functions required to support functional mine. She is a highly motivated friendly individual, who believes in team work, outgoing, charismatic, easily adapt to new environments and changing priorities. Possess excellent communication and interpersonal skills.