

# The effects of increased freshwater inflow on metal enrichment in selected Eastern Cape estuaries, South Africa

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## **Abstract**

The concentrations of select metals (Cd, Co, Cu, Fe, Pb, Ni and Zn) within the water column and sediment of the permanently open Kariega Estuary and temporary open/closed Riet and East Kleinemonde Estuaries were investigated during a dry and a wet season. Enrichment factors (EFs), using Fe as a reference element, and baseline linear regression models for metals vs Fe were used to assess the extent of metal enrichment in the sediments. The results of the study indicate that Cd, Co Ni and Pb were enriched above baseline concentrations ( $1.0 < EF < 4.1$ ) in the sediments of all three estuaries. Co, Pb and Ni enrichment in the Kariega Estuary sediments was significantly higher during the dry season, and the mean concentrations of Pb and Cd in the water column were 19-fold and 66-fold higher in the dry season. The elevated concentration of metals during the dry season could be related to accumulation of diffuse pollution from human activities within the catchment area. Conversely, inflow of freshwater into the estuary had the net effect of reducing the concentration and enrichment of these metals within the Kariega Estuary due to scouring and outflow of estuarine water and sediment into the marine environment.

The temporal variations in metal concentrations and enrichment factors were less pronounced in the temporary open/closed estuaries than the Kariega Estuary. The observed trend can probably be related to the low anthropogenic impact within the catchment areas of these systems, and the relatively smaller size of the catchments. Significant spatial variations existed in metal enrichment in the sediment of both the East Kleinemonde and Riet Estuaries, with the highest degrees of enrichment occurring in the sediments from the marine environment and lower reaches.

**Keywords:** metal enrichment, estuaries, sediment and water, South Africa