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## Assessment of environmental risk associated with water and sediments sourced from freshwater systems in highly contaminated areas

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**Statement of the Problem:** As a developing economy, South Africa has historically been, and is presently, marred by environmental issues. These emanate from various anthropological pressures related to industrial, agricultural and domestic-related activities. The most notable of these issues being contamination of freshwater systems in heavily industrialized areas, particularly those in the northern-most regions of South Africa. Pollution of these water bodies has been accompanied by mortalities of aquatic organisms and ill-health of people in communities sourcing this water directly for domestic purposes. Numerous researchers have reported the presence of persistent organic pollutants (POPs) in water, sediments and aquatic organisms collected in these areas.

The accumulation of POPs in aquatic systems is of concern, since they persist and have adverse effects on organisms. Specific and non-specific immunity in fish and mammals may be altered by their exposure to POPs. Organic compounds, including PAHs, have been found in the stomachs of fish and in crocodile carcasses, originating from the affected water bodies in South Africa. Although a preliminary study indicated the presence of PAHs no information is currently available on the identity and levels of other POPs in the water system. Sediments contaminated with POPs can be used as an indicator for establishing the nature of these pollutants, since these compounds sorb onto the sediment particles.

The effects of exposure to water and sediments, collected from the area, toward the development of zebrafish embryos were monitored for three years. These data were used to develop a hazard classification system for freshwater bodies from the mortality responses observed in zebrafish embryos exposed to water and sediments. These responses, together with water quality parameters and total compound concentrations, were incorporated in chemometric analysis to determine the key driving factors behind the deterioration in the quality of the water and sediment quality of the study area.