TECHNICAL BRIEF

November 2016
The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

Determining the presence of PAHs in aquatic systems of Soweto/Lenasia

A newly-completed Water Research Commission (WRC) study has determined the presence of polycyclic aromatic hydrocarbons (PAHs) in the aquatic environment of Soweto and Lenasia.

Background

Anthropogenic activities are increasing the occurrence of Polycyclic aromatic hydrocarbons (PAHs) in the environment. A previous WRC study pointed to the high levels of PAHs in the South African environment compared to other organic pollutants analysed for. The latest study investigated the exposure of humans and wildlife to 16 priority PAHs. The sites selected were the suburban areas of Moroka, Lenasia, Fleurhof, Elodrado Park, Orlando West, Orlando East, Nancefield and Dobsonville.

In addition to testing for the presence of PAHs in the study areas the project also determined the toxicity posed by the PAHs. This was done by assessing the sediments against sediment quality guidelines and quality indices.

The biochemical responses and overall health of fish was also investigated. Finally, the potential to human health was gauged under a health assessment index.

What are polycyclic aromatic hydrocarbons (PAHs)?

PAHs are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garage or other organic substances. The US Environmental Protection Agency has earmarked 16 congeners that must be monitored and controlled due to their proven harmful effects on humans and wildlife.

Results and discussion

The chemical analysis of PAHs on the sediment, fish and bird eggs confirmed the presence of PAHs in the study area. The sediments showed significant levels of PAHs, however, analysis of the pollutants in the biota produced little or no data – due to effective metabolism of the parent isomers.

The pollutant profile of the sediments indicated that the dominant sources of PAHs in the Soweto/Lenasia area are of pyrogenic origins, especially from the burning of biomass and to a smaller extent, petroleum combustion, probably from vehicles in urban areas. The sites of greatest concern was the site in the Moroka area.

Moroka had the highest PAHs levels for both seasons and exceeded most of the sediment quality guidelines. The quality indices revealed the same results – Moroka scored the highest values for the sediment quality guideline index, indicating that this site poses a high ecological risk to benthic biota.

Possible health risks to humans consuming fish from the

study area was investigated by conducting human health risk assessment by modelling risk from oral exposure. PAH levels in fish were extrapolated from levels found in the sediment.

Benzo(a)pyrene and dibenz(a,h)anthracene were identified as the main chemicals of concern, even when they did not occur in high concentrations. The risk calculated at each site showed that there is little risk to humans living in the study area.

Conclusions

The study concluded that there is a definite presence of PAHs in the Klip River of Soweto/Lenasia. The site that created the most concern based on chemical analysis and toxicity assessments was Moroka followed by Lenasia and Eldorado Park.

The biochemical responses and health assessment of the fish indicated that there are stressors present in the system – not necessarily PAHs – that resulted in hormonal disturbance effects in the fish. However, it seems that human in the area are not at risk at this time of exposure to PAHs, at least not through ingestion of the fish from the area.

Further reading:

To obtain the report, *Polycyclic aromatic hydrocarbons (PAHs) in the aquatic ecosystems of Soweto/Lenasia* (**WRC Report No. 2422/1/16)**, contact Publications at Tel: (012) 761-9300; Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.