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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.

TECHNICAL BRIEF

Environmental protection

Sources and occurrence of common brominated flame retardants

A WRC-funded study investigated the sources and occurrence of common brominated flame retardants in selected areas in Gauteng.

Brominated flame retardants

Brominated flame retardants (BFRs) are technical flame retardants containing brominated organic compounds which are applied to combustible materials such as plastics, wood, paper, electronics and textiles to meet fire safety regulations. The widespread production and use of BFRs, and strong evidence of increasing contamination of the environment by these chemicals, heighten the importance of identifying emerging issues and data gaps and of generating a future research agenda in South Africa. BFRs are relatively new environmental contaminants in developing countries such as South Africa and information about their environmental fate and toxicity is scarce.

The study was undertaken to investigate the existence of these emerging compounds in landfill leachates, sediment and groundwater to evaluate the presence of polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs) in the aforementioned environmental matrices as well as establish whether or not they are at levels that might raise public health concerns.

Import and export

The South African Customs and Excise report on imported and exported chemicals showed that in 2007, 496 039 kg PBBs were imported and 191 182 kg exported and in 2008 the figures were 60 963 and 34 555 kg. Information on products containing BFRs could not be obtained from any source and it was not clear from the information obtained from South African Customs and Excise whether other forms of BFRs were also imported or exported in 2007-2008.

Legislation on hazardous substances

With respect to legislation on the control of BFRs in South Africa, results show that there are two main Acts that are used to control the handling and management of chemicals and pesticides in South Africa, and these are: the Fertilizers, Farm Feeds and Agricultural Remedies and Stock Remedies Act No 36 of 1947 and the Hazardous Substances Act No15 of 1973. Several Government Notices and Regulations that address Fertilizers, Farm Feeds and Agricultural Remedies and Stock Remedies as well as Hazardous Substances stem from these two main Acts. Of particular interest is the Hazardous Substances Act which defines and provides four groups of hazardous substances to be declared by the Minister of Health and categorized according to their nature and the degree of danger they pose.

Although there is no specific legislation on the control of BFRs in South Africa at the moment, the aforementioned section 2 (1) (a) of the Hazardous Substances Act (Act 15 of 1973) can be seen to serve the purpose of controlling BFRs. Other legislation that may be used in controlling BFRs include: The National Water Act 36 of 1998 and The Customs and Excise Act 91 of 1964.

BFRs in landfill sediment and leachates

Sediment and leachate samples were collected from two landfill sites, namely Kwaggasrand and Hatherley around Pretoria for the investigation. The analyses of samples collected from the two landfill sites have shown the presence of BFRs in landfill sediments, leachates and groundwater. Sediment samples showed higher concentrations of PBBs and PBDEs than leachate samples.

Groundwater contamination

Correlations between PBDEs in leachate and groundwater samples suggested that the groundwater contamination was as a result of the landfill. There is cause for concern about the levels of PBBs and PBDEs obtained in the present study.

A significant correlation between the most common PBDEs in groundwater and landfill leachate for the two sites was observed. The concern is that PBDEs are persistent new emerging chemicals, with relatively scarce information on their movement in the environment.

Preliminary screening indicators

All the PBDEs were detected in at least one of the samples. The following PBBs and PBDEs were detected in all samples from the two sampling sites: PBB-4, PBB-10; PBDE-17 and PBDE-47. In addition BFRs, PBB-49, PBDE-28, PBDE-66, PBDE-77, PBDE-100, PBDE-138, PBDE-153, PBDE-154 and PBDE-183 were detected in the leachate, sediment and groundwater samples.

The detection of PBB-4, PBB-10, PBDE-17 and PBDE-47 in all the samples indicated that these were the most common BFRs in the samples analysed. These congeners can thus be used as preliminary screening indicators of BFRs contamination in environmental matrices.

PBDE-17 exhibited the highest concentrations for sediment and leachate samples from the two sites. For the BRFs detected, the concentrations of PBDEs are significantly higher than those of PBBs.

Implications of Rotterdam convention

The study has shown that to date there is no specific legislation on the control of BFRs in South Africa. However, the regulation under SANS10228 and section 2 (1) (a) of the Hazardous Substances Act, 1973 (Act 15 of 1973) can be used to control BFRs. Other legislations such as The National Water Act 36 of 1998 and The Customs and Excise Act 91 of 1964, may also be used to control BFRs.

South Africa is signatory to the Rotterdam Convention which has identified PBB as one of the chemicals that needs to be severely restricted or banned, the Convention can be invoked in the control of BFRs in South Africa. The Stockholm Convention affirms the need to effectively control persistent and bioaccumulating chemicals.

To estimate the extent to which the burden from various sources contribute to the total amount of BFRs released into the South African environment, investigations on more landfill sites, surface water, groundwater, sewage sludge and biota at regional and national levels need to be conducted.

Further reading:
To obtain the report, *Scoping study on the sources and occurrence of common brominated flame retardants in selected areas in Gauteng, South Africa* (**WRC Report No: KV 287/11**), contact Publications at Tel: (012) 330-0340; Fax: (012) 331-2565; Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy.