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Emissions of brominated flame retardants in Asia: consideration of its potential risk form the view point of the Norwegian regulation

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Flame retardants can be divided into two broad categories: additive or reactive, which can be further more divided into brominated or non-brominated sub-categories. These retardants are found in many commercial products such as computers, television sets, furniture, carpets, etc. They are of environmental concern due to their persistence, potential for bioaccumulation and widespread distribution via atmospheric transport, and possible adverse effects in wildlife and humans. Tetrabromobisphenol-A (TBBPA) is mainly used in electrical and electronic appliances (circuit board in particular), and the application of TBBPA accounts for about two thirds of the global production of brominated flame retardant (BFR).

The European Union Risk Assessment does not support the restriction of TBBPA: i.e. no risk is identified for the reactive use of TBBPA such as in epoxy resin used in circuit boards. By contrast, in 2007 Norway notified the World Trade Organization of its intention to prohibit 18 substances from consumer goods (Notification No. 2007/9016/N), called the Prohibition on Certain Hazardous Substances in Consumer Products (PoHS). TBBPA is listed in this prohibition list.

Marine conservation is recognized as a key issue in Norwegian fishery management e.g. wastewater management in the framework of the North Sea Declarations. TBBPA is very water-soluble, and dimethyl-TBBPA is lipophilic and may accumulate in fat. TBBPA is not readily biodegradable and can have long-term effects in the aquatic environment. Norwegian examples are summarized: TBBPA was found in marine sediment samples from Tromsø harbor (northern Norway) and in Atlantic cod from Lofoten and Varanger; TBBPA has been detected in Norwegian peregrine falcon and golden eagle eggs; and TBBPA has been detected in the blood in the general population of Norway. From these viewpoints, it can be considered that Norway needs to strictly control TBBPA emissions.

In recent times, Asia has emerged as one of the leading centers for electronics production worldwide. China, Thailand, Malaysia and the Philippines are now in the forefront of electronics production worldwide, responsible for producing 50% of electrical and electronic equipment intended for developed country consumers. About 120 thousand tons/year of TBBPA are consumed worldwide, of which 75% is used in Asia, 15% in the USA and 9% in Europe. The great consumption of TBBPA in Asia indicates possible negative effects on the regional environment (aquatic environment in particular). A comparative study of sediments in rivers and costal zones shows 49.3 ng/g of polybrominated diphenyl ethers (PBDE) (one type of BFR) in Pearl River Delta (China), 94.7 ng/g in Dongjiang River (China), 0.5 ng/g in Portugal, 0.53 ng/g in Denmark, 0.6–17.6 ng/g in Netherlands. Nearly one billion people predominantly in Asia rely on fish for at least 30% of animal protein supply, so marine conservation is an important regional. In the Asia Pacific region, most data have been acquired from Japan, but there are few data in the other Asian regions.

Although knowledge concerning the environmental effects of TBBPA in Asia is limited, the following remarks can be given: (i) considering TBBPA solubility and its bioaccumulation, the Norwegian regulation (PoHS) strictly controls TBBPA in order to conserve the marine environment and protect the human health; (ii) Asia is the greatest consumer of TBBPA (75% of the global consumption); The concentration of TBBPA-like substance (PBDE) is very high in China's river and delta; (iii) animal protein supply to Asian people mainly depends upon fish. It is concluded that the Asian consumption of TBBPA has the greatest potential for bioaccumulation in food webs. It is reported that less is known about the environmental behavior of TBBPA than for the other BFRs. A wide and detail survey is urgent in the Asian risk assessment.