Prediction of the PCB pollution in the soils of Bursa, an industrial city in Turkey

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1. Introduction

Because of their toxic and persistent nature and carcinogenic/mutagenic health effects, polychlorinated biphenyls (PCBs) are among the twelve persistent organic pollutants (POPs) of the Stockholm Convention of 2001. The Stockholm Convention, signed by 125 countries globally, brought several responsibilities such as establishment of inventories on the levels of the POPs, decreasing and eliminating their presence in environmental media, etc.

PCB usage was banned in 1995 in Turkey [1]. PCBs have never been produced in Turkey, however it is known that PCB-containing equipment has been exported. According to a survey made in 2004 [1], 1972 capacitor and 290 PCB-containing transformer is being used by the industry, currently, which yields an estimation of approximately 5000 tonnes of PCB load in Turkey.

Thanks to the increasing concern about the risks that PCBs pose to human health and the environment, and the global initiatives such as the Stockholm Convention and European Union’s environmental regulations, Turkey has promulgated a regulation on the management of PCBs [2]. The regulations bring limit values to the presence of PCBs in the environment. There is an important lack of PCB data measured at different media in Turkey. This situation makes the management of the PCBs difficult and hinders the enforcement of the regulations. Article 16 of the Turkish PCB regulation [1] states that the soils polluted by PCBs above a level of 50 ppm must be treated as hazardous waste. Article 9 of European Council Directive of 96/59/EC [3] also brings the same target level by stressing the objective of decontamination as “to reduce the level of PCBs to less than 0.05% by weight and, if possible to not more than 0.005% by weight.” The Netherlands’ target values [4] for soil are related to negligible risk for ecosystems. Site concentrations less than target values indicate no restrictions. For practical and economical reasons, seven PCB Congeners (International Union of Pure and Applied Chemistry-IUPAC no 28, 52, 101, 118, 138, 153, and 180) are monitored to assess environmental exposure in Europe and they are generally referred as “Dutch 7”. These indicator congeners are generally considered to be stable in the environment and may be good markers for PCB exposure. The sum of the 6 congeners (except for PCB118 from the Dutch 7) is defined by the Netherlands’ regulation [4] and its value is 0.02 mg/kg dry matter.

Several investigators studied the PCB levels in the air of some cities in Turkey [5–8]. Aydın et al. [9] and Tor et al. [10] studied the PCB levels in the wastewaters, and Karakoc et al. [11] investigated the PCB pollution in the sea waters in Turkey. However, soil related studies are fewer. The only two published study on PCB pollution in the Turkish soils were conducted by Cetin et al. [5] and Meijer et al. [12]. Cetin et al. [5] studied the soils of an industrial region...