Introduction

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Biographical notes: H.M. Anawar obtained his Master of Science from Nagoya University and PhD from Niigata University, Japan in environmental geochemistry of trace elements. His current research interests are environmental biogeochemistry of trace elements in water, soils and plants. He worked as a visiting researcher at Hiroshima University, Japan and presently he is working as a researcher at IRNASA-CSIC, Salamanca, Spain. He has published many papers in different internationally respected journals.

A. Garcia-Sanchez completed his PhD in 1973 at the University of Salamanca on the geochemistry of trace elements in rock weathering and soil formation. He has published more than 100 papers in refereed journals and participated in more than 40 scientific meetings. His current research interests include field, laboratory and theoretical studies in environmental geochemistry, particularly with respect to arsenic, antimony, mercury, cadmium and other toxic trace elements in water, soil and plants, and also sorption processes in soil and water treatments. He is currently a researcher at the CSIC and a Professor of postgraduate at the University of Salamanca, Spain.

This special issue of the *International Journal of Environment and Pollution* represents recent advancements in water, soil and food chain contamination by toxic trace elements, phytoremediation, bioavailability and biomonitoring of trace elements by plants. Heavy metal contamination of agricultural soils poses environmental health risk to human beings and living biota in the environment. Therefore, in order to undertake remediation measures, it is essential to understand the biogeochemistry of toxic trace elements in the environment. This issue includes a total of 14 papers on aspects of biogeochemistry of toxic trace elements in water, soil and plants as well as the estimation of ecotoxicological risks. Among them, three papers deal with trace element contamination of water and soil by anthropogenic activities and their effects on drinking water, food and plant diversity. One paper provided baseline data for continuing studies of heavy metal soil leachability in a soil core near Xuzhou iron-steel plant, China, where Ag, Se, Bi, Pb, Cu, Zn, Cd, Sb, Se and Sn originated mainly from anthropogenic origin and displayed a systematic drop in concentration of these metals with depth. The other paper measured Hg concentrations in surface water samples (rivers, streams, mining ponds, springs) and fishes in the Cuyuní river basin (Venezuela) where artisanal gold mining caused a extensive mercury pollution due to extensive use of Hg in Au amalgamation processes. It calculated human health risk caused by fish intake based on WHO and EPA reference doses since they exceed the established limit of 0.5 mg/kg for food (EU Regulations). The other paper investigated the contributions of anthropogenic activities to trace metal contamination in the soils of the West African sub-region, and their effects on the plant biodiversity and vegetation structure of the area in Nigeria's Guinea Savanna.

Two papers focused on the use of plants as an environmental indicator of heavy metals in the air of the adjacent environment. One paper focused on the use of cypress tree bark as an environmental indicator of heavy metals deposition in Fuheis City, Jordan to evaluate the impact of emissions from cement industry in the adjacent environment. The other paper evaluated the occurrence and distribution of bryophytes and lichens in relation to air pollution in Nigeria. *Thlaspi caerulescens* J. & C. Presl is a well-known Zn/Cd hyperaccumulator and an emerging model species for heavy metal tolerance and accumulation. Therefore, one paper conducted detailed study of *T. caerulescens* root anatomy in comparison with the structure of roots of the closely related non-tolerant, non-accumulator *T. arvense* grown in mining affected soils of Slovakia. The other paper investigated the variation of the population density of *Thlaspi caerulescens* in both metalliferous mining soils and non-metalliferous soils in Central Slovakia. It also investigated the phytoremediation potential of the *T. caerulescens* to remove Zn and Cd from mining soils.

This volume includes two review articles. One of them made a review on recent advancements in phytofiltration of As and toxic heavy metals from contaminated water ecosystems. Arsenic and metal contamination in drinking and non-drinking water has created a global environmental health concern. Phytofiltration using aquatic and terrestrial plants has promising potential for the ex situ and in situ clean up of As and metal contaminated water. High Cd concentrations in soils represent a potential threat to human health since it is incorporated in the food chain mainly by plant uptake. The behaviour of Cd in soils depends on several factors related to both soil and plant characteristics. The other paper provided an overview of such factors as well as of the in situ soil remediation techniques most environmentally friendly in development in the most recent years. These include chemical inactivation by means of soil amendments and phytoremediation approaches.

Metal mining activities often lead to plant and soil contamination in the surrounding environment. Therefore, four papers are devoted to soil contamination by mining activities, estimation of total exposure and bioavailable fractions of heavy metals (Cd, Mn and Zn) in mining soils. One paper uses the bleeding sap of birches as a good indicator of the availability of mobile heavy metals such as Cd, Mn and Zn in soils. The other papers determined the total and bioavailable fraction of Cd and Zn contents in soils around mine spoils to point out the environmental threat of these toxic elements. In addition, it determined the bioavailability and phytoremediation potential of different plant species growing in mining affected soils. One paper studies the magnitude of soil contamination, followed by plant and food contamination by arsenic due to huge withdrawal of groundwater in this area. This paper concentrated the studies mainly in the paddy fields and few other agricultural fields, irrigated with arsenic-contaminated groundwater and pond water respectively. Furthermore, it investigated the daily dietary intakes of arsenic by the studied population from the drinking water and three main foodstuffs (rice, wheat and potato).

The objectives of the papers compiled in this issue are to provide the information necessary to adopt environmental remediation strategy and to protect the living beings from the toxic effects of metal contamination in water, soil and plant ecosystems. The protection of these natural resources depends on the implementation of remediation measures suggested, proper waste disposal strategies, evaluation and management of environmental risk and safety.