

Preface

Research on potentially harmful elements (PHEs) in the environmental, agricultural and life sciences is extensively increasing since the last decades, owing to the larger consciousness of general population of the risks induced by anthropic activities to human health.

This book is dedicated to the occurrence and behaviour of PHEs in the different compartments of the environment, with special reference to soil as one of the most vulnerable ecosystems, and a precious resource with limited resilience capacity.

Current studies of PHEs in ecosystems have indicated that many industrial areas near urban agglomerates, abandoned or active mines, major road systems (highways and national roads) and ultimately also agricultural land act as sources, and at the same time sinks, of PHEs (particularly Zn, Cu, Cd). In these areas, large amounts of metals are recycled or dispersed in the environment, posing severe concerns to human health. Therefore, starting from the atmosphere (Chap. 1), through the aquatic environment (Chap. 2) and the different soil compartments (Chaps. 3, 4), the book also encompasses all the anthropic systems where PHEs play a significant role (mine and urban areas, Chaps. 5, 6). The soil-plant relationships, and the element fluxes from soil to plant and the food chain, including an overview on soil remediation, are explored in Chaps. 7, 8. In the last part of the book, trace elements join the food safety (Chap. 9) and the risk assessment (Chap. 10), concluding with potential risk to human health (Chap. 11), which is the main purpose of the whole book: to ensure a safe environment and a good quality of life to new generations.

The book provides new insight on the role and function of PHEs in the environmental and human health, following fundamental textbooks (e.g. Ferguson 1990; Adriano 2001; Kabata-Pendias and Mukhejre 2007; Brevik 2013; Alloway 2013) and papers (e.g. Lag 1980, 1984; Nriagu 1988; Nriagu and Pacyna 1988; Thornton 1993; Oliver 1997; Abrahams 2002; Bernard 2008; Steinnes 2009) without forgetting recent thousands of contributions from several scientific domains, not only soil science, but also plant physiology, biology, epidemiology, medicine, and in particular oncology.

The book covers a list of most environmentally important elements involved in environmental and human health, subdivided in *key elements* and *emerging elements*. *Key elements* include: arsenic (As), cadmium (Cd), chromium (Cr), mercury (Hg), lead (Pb), and selenium (Se). *Emerging* are those elements that have received less scientific attention, but nevertheless are of potential environmental significance, with reflection on human health: aluminium (Al), antimony (Sb), beryllium (Be), boron (B), cobalt (Co), copper (Cu), fluorine (F), iodine (I), manganese (Mn), molybdenum (Mo), nickel (Ni), thallium (Tl), tin (Sn), tungsten (W), vanadium (V), and zinc (Zn).

Thanks to the collaboration of numerous colleagues, the book outlines the state of art in PHE research in different environments and countries, and has been enforced with case studies and enriched with new data, not published elsewhere. The book will provide to stakeholders (both scientists and public administrators) and also to non-specialists a lot of data on the concentrations of metals in soils and the environment, and the critical levels so far established, in the perspective to improve the environmental quality, and the human safety.

We are grateful to colleagues who preceded us on this roadmap towards a more sustainable environment, and a better quality of life for human population.

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PHEs, Environment and Human Health

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