Health Effects from Hazardous Waste Sites


Every year billions of tons of solid waste are discarded in the USA. The waste materials range from common household trash to complex materials in industrial wastes, sewage sludge, agricultural residues, mining refuse, and pathological wastes from hospitals and laboratories. The last few years have seen the publication of numerous magazine and newspaper articles on hazardous wastes in the USA and other countries. Recent estimates indicate that since 1958, the 53 largest chemical manufacturers disposed of 766 million tons of chemical process waste at 3383 sites in the USA. Dumping sites tend to be located in states that have the greatest concentration of industrial activities, most of which are densely populated.

The U.S. Environmental Protection Agency (USEPA) estimated that in 1980 at least 57 million metric tons of the nation’s total waste load could be classified as hazardous. A hazardous waste is defined by 1976 Resource Conservation and Recovery Act as “a solid waste or combination of solid wastes, which because of its quantity, concentration, or physical, chemical or infectious characteristics may cause... an increase in mortality or an increase in serious illness... or... pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise mishandled.” In addition, the USEPA established four characteristics—ignitability, corrosivity, reactivity, and toxicity—as yardsticks by which to judge the degree of hazard. A list of chemicals falling under this definition was developed and new substances are added to this list as necessary. To date this list contains more than 53,000 chemicals. Estimates by USEPA regional offices suggest that there are as many as 50,000 improperly operated sites containing hazardous wastes as defined above.

From a public health standpoint, the contamination of drinking water probably represents the largest waste-site-related health problem. Thus, increasingly, citizens are becoming aware of the potential harm of hazardous waste sites near their communities. The USEPA has estimated that as many as 30,000 waste sites may pose significant health problems related to groundwater contamination, and that over 40% of the U.S. population currently relies on groundwater as a source of drinking water.

Assessing the adverse human health effects of chemical exposure from waste disposal sites and other point sources is at best difficult. This hardcover book, however, provides a comprehensive and useful orientation on the nature, risks, methodologies, and limitation in assessing possible human health exposures and risks from hazardous waste sites. The book contains 13 well-prepared chapters, four appendixes, and an index. Each chapter contains a list of references, and the book contains numerous, well-prepared illustrations. The chapters are grouped in five sections: (i) Scope of the Problem, (ii) Assessment of Exposure to Hazardous Wastes, (iii) Determining Human Health Effects, (iv) Role of Social Groups in Defining Health Risks at Waste Sites, and (v) Case Studies.

The chapter “Evaluating Health Effects of Exposure at Hazardous Waste Sites” by G. M. Marsh and R. J. Caplan is a comprehensive review with 78 pages. The remaining chapters are based on presentations at the Fourth Annual Symposium on Environmental Epidemiology that was held at the University of Pittsburgh Graduate School of Public Health in May 1983.

The book should be useful to those interested in hazardous wastes, their fate in the environment, and the health effects of such wastes.—M. A. TABATABAI, Department of Agronomy, Iowa State University, Ames, IA 50011.

Chemistry and Biology of Solid Wastes, Dredge Materials and Mine Tailings


The advent of the industrial era has resulted in enormous increases in environmental levels of trace metals. Natural systems that have evolved under relatively low bioavailable levels of these elements exhibit a wide range of acute and chronic toxicities when exposed to these elevated concentrations. Two sources of anthropogenic trace elements, and the subject of this volume, are dredged sediments and mine tailings. This book examines in 12 chapters the chemical and mineralogical trace element characteristics of dredged sediments and mine tailings, and the chemical and biological processes that determine the fate of trace elements from these two sources in the terrestrial and aquatic environment. This volume is the first of two, the second entitled Environmental Management of Dredged Material and Mine Tailings.

The specific subject matter of this book is prefaced by three excellent review chapters on the chemical and biological processes that determine trace element environmental fate. “Metals in Aquatic and Terrestrial Systems: Sorption, Speciation and Mobilization” (A.C.M. Bourg), “Microbial Oxidations of Minerals and Mine Tailings” (B.C. Kelley and O.H. Tuovinen), and “Response of Plants and Vegetation to Mine Tailings and Dredged Materials” (W.H.O. Ernst) are each excellent and thorough reviews of current knowledge of the natural processes affecting trace element fate. These chapters will be very useful to researcher, teacher, and student alike.

The remaining nine chapters can be classified into two types: case histories and assessment methodology. A wide range of case histories of trace element fate from disposal of dredged sediments and mine tailings are described for Canada, the USA, the United Kingdom, Greenland, Chile, Oceania, Australia, Japan, and the Netherlands. These case histories detail characterization, monitoring, and modeling of trace element transformations and movement at large-scale disposal sites. Assessment methodologies are described in two chapters, “Geochemistry of Priority Pollutants in Anoxic Sludges: Cadmium, Arsenic, Methyl Mercury, and Chlorinated Organics” (M. Kersten), and “Assessment of Metal Mobility in Dredged Material and Mine Waste by Pore Water Chemistry and Solid Speciation” (U. Forstner and M. Kersten). Both chapters emphasize the equilibrium thermodynamic geochemical approach to assessment of trace elements in these waste materials. The first chapter also discusses (although superficially, in spite of or perhaps because of its complexity) trace organics contamination.

The book is well edited and the quality of the illustrations is adequate. It will be an invaluable source for researchers, managers, and university teachers and students interested in all aspects of trace element environmental biogeochemistry. This reviewer also looks forward to seeing the companion text.—T.J. LOGAN, Agronomy Dep., The Ohio State University, Columbus, OH 43210.