

many others. To meet the requirements of larger audience of hydrologists, the material covered is incomplete and falls short of the current concepts that are developing in geochemistry of waters (*e.g.* diffusion of dissolved ions, water-quality models) which are of day-to-day concern to hydrologists dealing with problems of pollution, water quality management, age dating and water conservation.

Despite these limitations, the present volume can form the nucleus of a future edition with enlarged scope and utility for a wider circle of hydrogeologists.

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**GEOLOGY AND HAZARDOUS WASTE MANAGEMENT, (1996), by
Syed E. Hasan, *Prentice Hall*, New Jersey, 387 pp.**

The Bhopal gas tragedy has opened our eyes to the heavy price in terms of human life paid for our errors and omissions in the past. The current problem of arsenic-contaminated groundwater in parts of West Bengal is yet another developing example of lack of environmental awareness in human health and well-being.

Therefore, this recent publication authored by Professor Syed E. Hasan of the University of Missouri-Kansas City is not only most relevant and timely but a welcome addition to the literature on Environmental Geology and Hazardous Waste Management. The author has succeeded admirably in interweaving the basic geological principles and processes with the engineering, scientific and regulatory aspects of hazardous waste management. The book written with the objective of serving as a text at the University level for courses in hazardous waste management offered in the geology, environmental science, geotechnical and geological engineering fields is lucidly written with a wealth of information culled from diverse sources.

The introductory chapter includes a historical perspective, relevance of geology to waste management and the inter-disciplinary nature of the subject. Basic geological concepts are introduced in the second chapter covering the geochemical, hydrological and climatic cycles.

Chapter three opens our eyes to the mind boggling variety and volume of hazardous wastes generated in modern industrial-urban complexes and the definition of hazardous waste according to the US Environmental Protection Agency (EPA). Environmental laws and legislation in USA giving the permissible contaminant levels of synthetic organic chemicals, inorganic chemicals *etc.* are dealt with in chapter four.

Chapter five deals with environmental legislation in different countries, where India is also covered. The author's comment pertaining to India that "despite the regulatory changes and more stringent action by the courts, compliance with the law has been sluggish. Some of the reasons: understaffed Pollution Control Boards, lack of comprehensive industrial zoning policy, financial constraints faced by companies and lack of cost-effective technology". Except Japan, no Asian country appears yet to address the environmental problems comprehensively, according to the author's opinion.

Chapter six deals with the recent trends in waste management and the underlying philosophy that has been changing over a period. Highest priority is now accorded to pollution prevention in the first instance followed by recycling, treatment and disposal in that order.

Chapter seven deals with the physical, geotechnical and geochemical properties of Earth materials – soils, rocks and minerals from the twin perspectives of pollution and hazardous waste management.

Chapter eight deals with hydrogeology – an important subject from the view point of human settlements. Chapter nine is devoted to contaminant transport in the subsurface groundwaters as a result of human activities.

One of the essential requirements of detection of pollution is the ability to analyse and detect various pollutants in air, water, soil and rocks. Chapter 10 deals with the chemical analysis and quality control of the various analytical tools; Gas Chromatography Mass Spectrometry (GC-MS) and Inductivity Coupled Plasma Mass Spectrometry (ICP-MS) are the most common techniques employed in US in the hazardous waste management industry. Chapter 11 deals with hazardous waste site selection and assessment wherein emphasis has been placed on developing a geologic model based on the project and site geology.

Personal protection and safety at hazardous waste sites of different types like – biological hazards, chemical exposure, fire and explosion, heat stress, ionising radiation, oxygen deficiency, noise *etc.* are dealt with in chapter 12 in a comprehensive way. The illiterate and uninformed workers in India are often oblivious to the ill-effects of handling pesticides/herbicides/insecticides, detergents and a host of chemicals of diverse nature and a perusal of this chapter gives some of the mandatory protection measures employed in the more advanced countries.

Finally, chapter 14 deals with the methods of hazardous waste disposal by thermal, land disposal (including underground) and ocean disposal methods adopted for difficult hazardous wastes in different countries and settings.

Appendices A to J tabulate a wealth of information, like the detailed listing of hazardous wastes, environmental agencies in US, databases/journals in environmental science, courses offered in US and an introduction to toxicology. The glossary at the end enumerates the terminology of Environmental Geology and related areas in a succinct way.

The get up and lay-out of the book is pleasing and the quality of printing excellent. Number of line drawings and illustrations illuminate the text matter appropriately. The publication is recommended for all the Libraries of Geology Departments, Environmental Science Departments and the National Organisations/Institutions dealing with Environment and Geology. A greater part of future geological work may well be oriented towards environmental problems and concerns and the geological profession has to reorient its major tasks ahead accordingly. This book authored by an Indian settled in USA puts us in touch with trends in the advanced countries in managing the environment for a sustainable lifestyle and needs of the society.

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