is a combination of this life-cycle analysis and risk assessment that makes this book unique.

In the preface, the authors briefly outline the book's contents:

> "The first four chapters of the book give a general overview of environmental management strategies, describe life-cycle assessment and risk assessment and place them in the so-called environmental management toolbox. The fifth chapter supplies additional information on techniques for data analysis that are commonly used in the analysis of environmental impacts. The sixth and seventh chapters show the interfaces between life-cycle assessment and risk assessment and provide ways of integrating the two. In the final chapter, resolved exercises of integrated life-cycle and risk assessments are presented."

An interesting technique employed in the writing of this book was the use, in several places, of a common case study, i.e., a Municipal Solid Waste Incinerator in Spain. This incinerator was first studied to identify, evaluate and compare the environmental loads from its production of electricity by incineration of municipal waste.

In a second example using this incinerator, the authors examine the risk from the emissions of PCDD/FS using a Monte Carlo approach. A third analysis involving the incinerator (but not the specific process noted above) was of the environmental damage estimation of the waste incineration process chain. A final case study examined the site-dependent impact indicators used for the waste incineration process chain.

Designed to be used as a text, each chapter has a list of questions and exercises for student assignment.

Sustainability is, I believe, the next logical step in environmental analysis but it requires a life-cycle approach in which all stages of product production, use, and disposal are examined. This book advances that analysis but adds to it risk assessment. Both types of analysis are essential according to the foreword to the book written by Mary Ann Curran of the US EPA. I fully agree with this comment.

Gary F. Bennett

doi:10.1016/j.jhazmat.2004.02.017

Contaminated Ground Water and Sediment: Modeling for Management and Remediation

Calvin C. Chien, Miguel A. Medina Jr., George F. Pinder, Danny D. Reible, Brent E. Sleep, Chunmiao Zheng (Eds.), Lewis Publishers, Boca Raton, FL, 2003, 283 pp., US$ 139.95, ISBN 0-56670-667-X

This book is a product of a workshop held in 2000 on the topic "Modeling and Management of Emerging Environmental Issues". Approximately four dozen modeling experts participated. These attendees were divided into four panels with each panel addressing a different environmental contamination or remediation problem. This book resulted from those panel discussions. Each panel produced a chapter on the topic it addressed. These chapters are written by one of the panel members with input by other panel participants.

Reproduced below are the topics of the panel reports and brief summaries of the contents thereof.

1. Surface water–ground water interactions and modeling applications.

   "This panel examined the technical complexities of surface water and ground water interaction on a spatial and temporal scale. The regulatory framework of mixing zones was reviewed, and the policy implications of mixing zones on ground water and surface water interaction were discussed. The panel focused on mathematical modeling of these processes and reviewed the state-of-the-art technology in aqueous mixing simulation models. Advantages and disadvantages of different modeling approaches, time, and spatial resolution disparities, and aggregation–disaggregation were also discussed."
2. The role of modeling in managing of contaminated sediments.

   "This chapter summarizes applications of quantitative prognostic models of contaminant processes in sediments, assesses the state-of-the-art of these models with respect to accuracy and adequacy, and identifies research that can contribute to improvement in model development and their use in resolving sediment management challenges."
3. Optimization and modeling for remediation and monitoring.

   "The focus of this chapter is optimization and modeling for remediation and monitoring. The goal is to provide the reader with insights into optimization and modeling tools available for cost-effective resolution of environmental problems, especially as they pertain to ground water contamination and its long-term impacts. To achieve this goal, the technical and practical challenges inherent in this approach are presented as well as documented accomplishments. Utilizing this organizational approach, the reader should comprehend both the financial benefits and the anticipated costs associated with using optimal design and modeling when resolving and managing problems addressable via this technology.

   The chapter is subdivided into the following three main topics: the user's perspective, current state of knowledge, and gaining acceptance. Each topic is further subdivided to address many of the specific issues of current importance to the professional ground water community."
4. Modeling fate and transport of chlorinated organic compounds in the subsurface.

   "The panel discussed issues associated with simulating chlorinated organic compound behavior in the subsurface. Presentations by panel members focused on

modeling chlorinated organic compound fate and transport under natural conditions rather than under enhanced remediation conditions. The uncertainty associated with constitutive relationships appropriate for use in field-scale modeling was identified as an area for continued research. Aspects of modeling DNAPL source dissolution and volatilization were covered, and practical techniques for modeling source-term behavior at the field scale were presented. The problems of dealing with subsurface heterogeneities in simulating field-scale DNAPL behavior were identified, and the need for upscaling methods and robust inverse modeling techniques were emphasized. Several presentations addressed the current practices for modeling the natural attenuation of chlorinated compounds. Chlorinated compound biodegradation models of varying levels of complexity were reviewed. The need for a framework for choosing the appropriate level of simplification in modeling was discussed, and the need for technology transfer to end users of models was emphasized.

The objective of this chapter is to review the state of the art with respect to the simulation of chlorinated organic compounds in the subsurface and to present the conclusions and recommendations of the panel with respect to basic research needs and issues of technology transfer. Basic concepts and equations underlying models for chlorinated organic compound behavior in the subsurface are reviewed in Section 4.2. The current state of practice with respect to modeling chlorinated organic compound fate and transport is described in Section 4.3. Section 4.4 contains field applications presented by the panel. Research needs identified by the panel are discussed in Section 4.5, while Section 4.6 examines aspects of technology transfer required for the effective promulgation of simulation models for chlorinated organic compounds."

The use of models has markedly increased in recent years. Modeling has aided both the understanding of environmental processes and remediation. This book furthers those tasks.

Gary F. Bennett

doi:10.1016/j.jhazmat.2004.02.027