Book Review

KARST HYDROLOGY AND HUMAN ACTIVITIES

Reviewed by **Ken Grimes**

Karst Hydrology and Human Activities is a new text edited (and partly written) by David Drew and Heinz Hötzl and published in 1999 by AA Balkema of Rotterdam on behalf of the International Association of Hydrologists (IAH). My copy (hardback, 322 pages) cost about $109.00 Australian when ordered through DA Information Services.

This is not a text book on karst hydrology so much as a manual on groundwater management in karst areas based on case studies from all over the world. The objective of the IAH was to contribute to a growing understanding of the special and vulnerable character of karst groundwaters by publishing examples of human impacts on karst. Unlike a number of previous books with similar titles, this one is more than just a seemingly-random collection of case studies or conference papers. The editors have added useful, and well-coordinated introductions to each chapter, and have obviously given some thought to their selection of case studies - some of which go beyond just a description of a specific site to provide a review of a whole issue.

The book is organised into three sections: First is an overview and historical perspective of karst waters and human activities and impacts (with perhaps a tad too much ancient history - but Elery will like it!). Then comes the main part with chapters on the impacts of: agriculture (land clearance, irrigation and drainage, pollution), industry and urban development (a variety of nasty air, liquid and solid pollutants, and impacts from construction and tourism), extractive industries (mines and quarries), and water exploitation (e.g. over-production, ground subsidence, salt-water intrusions). Each chapter in this section has an introduction summarising the activities involved, their impacts and possible responses, which is then followed by several integrated case studies. These case studies range from short notes to quite long expositions and come from all around the world - including two from Australia. A final section briefly reviews the vulnerability of karst waters and then provides a country-by-country summary of legislative responses that have been introduced. This last will obviously date fairly quickly, and is naturally dominated by the USA and Europe where the combination of extensive karst areas and large populations has generated significant public awareness. For Australia, the only mention is of the Tasmanian Forestry Practices Code. The final chapter looks to the future: discussing risk assessment in karst, restoration, and possible future threats such as climate change, continuing urban spread, and tourism which is bringing stress to remote karst areas.

The book assumes some familiarity with the basic principles of karst groundwater systems, but many of the concepts can be picked up as you read. It provides an excellent review of the various problems that can occur in karst aquifers with some very relevant (and at times horrific) real examples. Being a compilation of case studies and reviews by different authors the treatment and level of technicality tends to vary somewhat. The introductions to each chapter are generally excellent, as are most of the case studies, but I felt that some were a bit too brief, and a few had limited relevance.

Some of the better studies included Worthington's contribution, which is only two pages long, but provides a succinct discussion of aquifer contamination by sewage in an area where there was a marked distinction between contaminated flow to distant springs via major conduits and non-contaminated water-wells much closer to the source that were tapping the lower-permeability limestone between the conduits. Hötzl & Nahold present a detailed discussion of remediation of contamination by chlorinated hydrocarbons (chemicals used in dry-cleaning, degreasing & slaughterhouses). These belong to a class known as Dense Non-Aqueous Phase Liquids (DNAPL) that are a problem because they sink through the aquifer waters without mixing and tend to be trapped in depressions at the base of the system. The methods documented here will be useful when similar problems occur in Australia. Carrasco-Cantos & others describe how visitor numbers in a Spanish tourist cave have affected the drip-water chemistry (especially the saturation index) with a consequent danger of re-solution of speleothems. An anomalous chemistry of drip waters near the cave entrance was traced to the use of karst-well water in the gardens above. Gunn & Hobbs review the varied hydrogeological impacts of limestone quarries - both during their operation (a range of problems) and after they close (and either fill up with water, or provide a tempting site for rubbish disposal). The two Australian case studies are by Mark Ellaway, Brian Finlayson & John Webb, who provide a short description of the effect of agricultural activities (and a rubbish dump) on the water chemistry at Buchan, Victoria; and David Gillieson and Ian Houshold, who summarise the rehabilitation of the Lune River Quarry in Tasmania. The Gambier Karst does not get a specific case study, but there are a number of references to the karst water problems of that area scattered through the book.

This book is an excellent introduction to the varied problems that can occur in karst groundwaters. I recommend it to all managers of karst regions and to those responsible for assessing the environmental impact of proposed developments in karst.