

## Book review: Urban Geology

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Urban Geology edited by Peter Huggenberger and Jannis Epting (Huggenberger and Epting 2011), with contributions from a group of multi-disciplinary geo-scientists largely based in Switzerland, is an important addition to the growing applied science of urban hydrogeology and engineering geology. Primarily based on experience gained through various projects undertaken for Basel, a highly industrialized urban environment in Switzerland, the book provides a clear illustration of how adapted approaches can be applied in reality using modern techniques and methods.

The book is organized into five relatively concise chapters. It begins with a description of the four main chapters of the book. A brief introduction on urban settings sets the scene to highlight the concept of integrated adaptive subsurface resource management. This is followed by the presentation and discussion of the methodology. Examples and case studies of its application are substantially documented. As the case studies constitute almost half the space of the book, an emphasis seems to be placed on practical application of the urban geological theories. A glossary is provided at the end of the book; as the clearly-defined terminology of multi-disciplinary topics is always required for good reading comprehension, this is helpful to the reader, although the Glossary could be expanded to include some ideas that are not explained. The book is written in the first person and this is somewhat unconventional for a publication of this nature. This style might be off-putting for some readers.

The topic of urban geology emerged roughly in the mid-1960s with growing concern about the impact of urban sprawl on the environment. Urban geology, as defined in the Glossary of this book, clearly states that as a branch of geology, urban geology provides information required for sound urban planning and sustainable development in densely populated areas. The book places emphasis on sustainable use of subsurface resources, which would cover aspects of the subsurface infrastructure, groundwater body and geothermal energy, though the definition of 'subsurface resource' itself is not given in the book. An application of this concept within Basel is stressed including an account of integrated adaptive groundwater management. The adaptive approach is exemplified by the thematic discussions covered in chapter 3, namely, System and risk profiles (Section 3.1), Flow across boundaries (Section 3.2), Vulnerability and quality control systems (Section 3.3) and Climate change (Section 3.4). These sections logically outline a host of hypotheses and concepts that are later applied in the case studies. The International Association of Hydrogeologists (IAH) published its selected papers from the 32nd International Geological Congress, which took place in Florence, Italy, in 2004. The

election is entitled *Urban Groundwater: Meeting the Challenge* (Howard 2007). By comparison, the book under review here offers a specific example of how urban development issues could be approached, especially where the subsurface resource use is dominated by activities that have taken place since early industrialization. The approach chosen in the book helps to reinforce both theoretical concepts and practical applications.

Many aspects of urban livelihoods and development are touched on in the book. They range from groundwater source and aquifer protection, impacts of infrastructure development, contaminated sites, urban karst process and land-subsidence, geothermal systems, to natural hazards in urban areas. Basel, located in northwest Switzerland on the river Rhine, is Switzerland's third most populous city where the Swiss, French and German borders meet and witness the thriving of a tri-national urban agglomeration. For this reason, investigation of the urban geological problems, including the way that transboundary aquifer systems affect Basel, is challenging. Issues include data mining and sharing in the multinational urban context. Though the Law of Transboundary Aquifers was codified by the UN General Assembly in its resolution 63/124 in 2008 (Yamada 2011), the Basel experience of institutional cooperation has confirmed that the continued emphasis of national governments on sovereignty and national interests has prevented international border regions from achieving basic goals of infrastructure integration and the harmonization of environmental policy.

What can be learnt from this relatively succinct publication, is that groundwater, as a common commodity, is penetrating into various areas of urban livelihood and development. As such, the monitoring and assessment of its roles and impacts in the urban context should be put into practice so that the resource can be used for the intended benefit. The book also illustrates that process-oriented research, grounded within academic institutes, could build a bridge that provides a fast transfer of knowledge from research to development.

The book falls short in offering adequate information on cost benefit number crunching or on assessing the value of groundwater in economic terms. These aspects may help to demystify the reasons that such multi-disciplinary projects were invoked in the first place. Nevertheless, in its concise form, the book does provide well-outlined insights into the sustainable utilization of the subsurface resources, especially groundwater resources in the case of the city of Basel. In Europe, where about 25 % of the total territory is urbanised to accommodate about 70 % of its total population, the urban population makes use of more than 40 % of the local aquifers to meet their water needs. Unlike the rural development issue, the management of resources in an urban catchment often necessitates a detailed three-dimensional investigation at the community or city scale. The publication of such a book has the potential to help develop a model of the impacts of subsurface resources use, which could be applied within similar urban environments.

One of the best things about this book is that the results emanating from practical and research projects undertaken for the city of Basel by 18 contributors, largely from academic institutes, over a period of years, have been very successfully integrated into a rewarding perspective of urban geology. Well done! Through this Basel case, the concept of integrated adaptive resource management is substantially backed up by practical project experiences, making the book an excellent reference for both students and practising geologists, hydrogeologists, ecologists, water engineers and town planners to consult in their endeavours to better understand the principles and practical applications of urban geology.

## **References**

Howard KWF (ed) (2007) Urban groundwater: meeting the challenge. IAH Selected Papers on Hydrogeology 8, from the 32nd International Geological Congress, Florence, Italy, August 2004. Taylor and Francis, London. ISBN 13 978-0-415-407458 (Hbk)

Huggenberger P, Epting J (eds) (2011) Urban geology. Springer, Basel, ISBN 978-3-0348-0184-3

Yamada C (2011) Codification of the law of transboundary aquifers (groundwaters). Special issue: Strengthening Cooperation on Transboundary Groundwater Resources. Water Int 36(5):557- 565