

Contents

1	Content	1
	Peter Huggenberger and Jannis Epting	
1.1	Chapter 2: Settings in Urban Environments	1
1.2	Chapter 3: Hypotheses and Concepts	1
1.3	Chapter 4: Methods	2
1.4	Chapter 5: Examples and Case Studies	3
2	Settings in Urban Environments	5
	Peter Huggenberger and Jannis Epting	
2.1	Infrastructure Development	6
2.2	Use Conflicts in Urban Areas	7
2.3	Legal Background	8
2.4	General Settings of the Outlined Case Studies	8
	References	12
3	Hypotheses and Concepts	15
	Peter Huggenberger, Jannis Epting, Annette Affolter, Christoph Butscher, Stefan Scheidler, and Jelena Simovic Rota	
3.1	System and Risk Profiles	17
3.1.1	Definition of System Profiles	17
3.1.2	Definition of Risk Profiles	18
3.2	Flow Across Boundaries	20
3.2.1	River Landscape Development	21
3.2.2	Major Interfaces	21
3.3	Vulnerability and Quality Control Systems	32
3.3.1	Vulnerability Assessment Methods	33
3.3.2	Quality Control Systems	41
3.4	Climate Change	43
3.4.1	Climate Change and Feedback Mechanism in Urban Environments	43

3.4.2 Effects of Predicted Climate Change on Groundwater Vulnerability	45
3.4.3 GWB Zones and Future Needs of Observation Networks	48
References	49
4 Methods	53
Peter Huggenberger, Jannis Epting, Annette Affolter, Horst Dresmann, Ralph Kirchhofer, Edi Meier, Rebecca M. Page, Christian Regli, Jelena Simovic Rota, and Stefan Wiesmeier	
4.1 Data Mining	53
4.1.1 Data Mining with GeoData	55
4.1.2 Evaluating Data Quality	60
4.1.3 Data Requirement for Modeling	60
4.2 Elements for Adaptive Resource Management	61
4.2.1 Monitoring	62
4.2.2 Field Investigations and Experiments	63
4.2.3 Modeling	65
4.3 Hydrogeophysics	71
4.3.1 Process Understanding	73
4.4 Aquifer Heterogeneity	80
4.4.1 Sedimentological Concept for the Description of Aquifer Heterogeneity	81
4.5 Statistical Analysis of Monitoring Data	87
4.5.1 Principal Component Analysis	88
4.5.2 Artificial Neural Networks	90
References	93
5 Examples and Case Studies	95
Peter Huggenberger, Jannis Epting, Annette Affolter, Christoph Butscher, Donat Fäh, Daniel Gechter, Markus Konz, Rebecca M. Page, Christian Regli, Douchko Romanov, Stefan Scheidler, Eric Zechner, and Ali Zidane	
5.1 Groundwater Protection and Hydrogeoecology	96
5.1.1 Current Status of Urban River Valleys	97
5.1.2 Main Changes from the Natural to the Channelized State of Rivers	99
5.1.3 Reconciliation of Water Engineering Measures Along Rivers	100
5.1.4 Endangerment and Hazard Assessment	101
5.1.5 Case Studies	102
5.1.6 Conclusions	110
5.2 Engineering Hydrogeology	113
5.2.1 Impacts of Urban Infrastructure Development	114
5.2.2 Concepts for Urban Infrastructure Development	114

5.2.3 Case Studies	115
5.2.4 Conclusions	127
5.3 Contaminated Sites in Urban Areas	127
5.3.1 Institutional Aspects of Cooperation in a Multinational Urban Context	129
5.3.2 Case Studies	130
5.3.3 Conclusions	135
5.4 Karst in Urban Areas	135
5.4.1 Karst Processes in Urban Areas	136
5.4.2 Concepts and Investigation Methods	137
5.4.3 Case Studies	138
5.4.4 Conclusions	155
5.5 Geothermal Energy	156
5.5.1 Geothermal Settings and Boundaries	158
5.5.2 Implementation of Geothermal Use Concepts for Borehole Heat Exchangers	160
5.5.3 Application of Monitoring and Modeling Methods	166
5.5.4 Conclusions	170
5.6 Natural Hazards in Urban Areas	171
5.6.1 Earthquakes in Urban Areas	172
5.6.2 Flood Events in Alluvial Valleys	180
5.6.3 Conclusions	186
References	187
Glossary	193
Index	203

Urban Geology

Process-Oriented Concepts for Adaptive and Integrated
Resource Management

Huggenberger, P.; Epting, J. (Eds.)

2011, XVI, 216 p., Hardcover

ISBN: 978-3-0348-0184-3