Contents

Preface *viii*
Acknowledgements *xiii*

1 Introduction: Challenges **1**

1.1 Climate change risk: Concepts and communication 1
1.2 How to determine the biggest global risks? 3
1.3 Quantitative Risk Assessment as a tool for accurately estimating risk 5
1.4 Security risks: The allegation that small risks are treated out of proportion to their importance 8
1.5 The call for a shift from risk to resilience 12
1.6 The development of a risk governance framework 13

2 Fundamentals about science, knowledge and research **19**

2.1 Science 19
2.2 Knowledge 24
2.3 Research (knowledge generation) 25

3 The risk analysis science: Foundation **29**

3.1 The risk analysis science – main features 29
3.2 How the risk analysis science generates knowledge (research methods) 46

4 Fundamentals about the risk concept and how to describe risk 57

4.1 The risk concept 57
4.2 How to describe or characterize risk 59
4.3 Discussion 83
4.4 Summary and conclusions 85

5 Risk assessment 87

5.1 Reliability and validity 88
5.2 Conservatism in risk assessment 94
5.3 Models in risk assessment: Cause-effect relationships 106
5.4 Rare events 112
5.5 Different actors 124

6 Risk perception and risk communication 138

6.1 Risk perception 138
6.2 Risk communication 145

7 Risk management and governance 168

7.1 Fundamental principles of risk management and governance 168
7.2 Cost-benefit type of analysis 172
7.3 Cautionary and precautionary principles: Robust and resilience-based strategies 178
7.4 The call for a shift from risk to resilience 188
7.5 Improving governmental policies: Some fundamental principles 197
7.6 Some foundational issues related to risk governance and different types of risks 217

8 Solving practical risk analysis problems 228

8.1 Standardization: ISO 31000 on risk management 228
8.2 Guidance on uncertainty analysis 236
8.3 A security case 245
8.4 Climate change risk 256
8.5 Competence and training in risk analysis 259

9 Perspectives on the future of risk analysis **261**

Appendix *264*

A. Terminology 264
B. Subjects and topics defining the risk analysis field 273

Bibliographic notes *279*
References *283*
Index *305*