

# Contents

<b>1 Introduction .....</b>	<b>1</b>
1.1 Roadmap to the Book .....	2
<b>2 A Brief History of Seismic Risk Assessment .....</b>	<b>5</b>
2.1 Introduction .....	5
2.2 Terminology .....	6
2.3 Overview of Seismic Risk Assessment .....	9
2.4 A Brief Chronology of Selected Events in Seismic Risk Assessment .....	11
2.5 How We Got Here .....	11
2.6 Vulnerability .....	30
2.7 Special Vulnerability Relations .....	40
2.8 Asset Identification and Attributes .....	44
2.9 Risk Analysis Methods .....	47
2.10 Assessment .....	50
2.11 Current Status .....	53
2.12 Concluding Remarks .....	55
2.13 Acknowledgments .....	56
References .....	57
<b>3 Perspectives on the History of Seismic Risk Assessment .....</b>	<b>83</b>
Introduction .....	83
3.1 Lessons Leaned from Current Practice and Future Needs in Regional Loss Estimation .....	84
3.2 The Dawn of Earthquake Investigations and Cross-Continent Interactions .....	89
3.3 Social Science Perspectives on Seismic Risk Assessment .....	96
3.4 Seismic Risk Assessment: History and Strategic Directions .....	97
References .....	99

<b>4 Strategic Directions in Seismic Modeling: HAZUS® Development and Current Applications for Catastrophe Planning.....</b>	<b>101</b>
4.1 Introduction .....	101
4.2 HAZUS® <sup>MH</sup> Earthquake Model Overview .....	102
4.3 Use of HAZUS® <sup>MH</sup> to Support Catastrophe Planning .....	104
4.4 Use of HAZUS® <sup>MH</sup> to Link Risk Assessment, Mitigation and Disaster Response.....	110
4.5 Utilization of a Web-Based Data Management Portal System....	113
4.6 Conclusions .....	115
References .....	115
<b>5 Perspectives on Development and Current Applications for Catastrophe Planning.....</b>	<b>117</b>
Introduction .....	117
5.1 Recommended Improvements for HAZUS® <sup>MH</sup> .....	118
5.2 User Dynamics and HAZUS® Development.....	123
5.3 Perspectives from a HAZUS® User.....	127
5.4 Strategic Directions for HAZUS® and Current Applications for Catastrophe Planning.....	129
References .....	132
<b>6 Loss Estimation Models and Metrics.....</b>	<b>135</b>
6.1 Introduction .....	135
6.2 Loss Dimensions .....	136
6.3 Components of the HAZUS® Loss Estimation Methodology .....	139
6.4 Current Limitations .....	143
6.5 Loss Calibration Studies.....	145
6.6 General Guidelines on the Use of Loss Estimates.....	150
6.7 Research Topics .....	153
References .....	154
Bibliography of Additional HAZUS® Studies.....	156
<b>7 Perspectives on Loss Estimation Models and Metrics.....</b>	<b>171</b>
Introduction .....	171
7.1 Model Validation and Priorities in Loss Metrics .....	172
7.2 Additional Considerations in Loss Estimation .....	175
7.3 Social and Economic Considerations in Loss Estimation Modeling .....	179
7.4 Strategic Directions for Loss Estimation Models and Metrics....	181
References .....	183

---

<b>8 Seismic Risk Mitigation Decisions Under Uncertainty .....</b>	<b>185</b>
8.1 Introduction .....	185
8.2 Seismic Risk Analysis for Nuclear Power Plants .....	186
8.3 Nuclear Power Plant Seismic Design .....	187
8.4 Recommendations for Seismic Risk Mitigation Decisions .....	193
8.5 Importance of Uncertainties .....	195
8.6 Summary .....	197
References .....	197
<b>9 Perspectives on Seismic Risk Mitigation Decisions Under Uncertainty.....</b>	<b>199</b>
Introduction .....	199
9.1 Perspectives from a Risk Assessment Practitioner.....	200
9.2 Seismic Risk Assessment and Mitigation: Current Issues.....	208
9.3 On the Importance of Network Considerations in Lifeline Risk Assessment .....	214
9.4 Strategic Directions for Seismic Risk Mitigation Decisions Under Uncertainty .....	222
References .....	224
<b>10 Modeling Seismic Mitigation Strategies .....</b>	<b>227</b>
10.1 Introduction .....	228
10.2 Structure of Catastrophe Models .....	229
10.3 A Comparison of Models .....	230
10.4 The Exceedance Probability Curve .....	233
10.5 Choice of Seismic Mitigation Strategies .....	235
10.6 Cost-Benefit Analysis.....	237
10.7 A Mitigation Example Using an Insurance-Based Model .....	238
10.8 Consideration of Decision Processes .....	242
10.9 Improving the Modeling of Seismic Mitigation Strategies .....	243
References .....	244
<b>11 Perspectives on Modeling Seismic Mitigation Strategies .....</b>	<b>247</b>
Introduction .....	247
11.1 Catastrophe Modeling Paradigm Shift .....	248
11.2 A Structural Engineering Perspective on Modeling Seismic Mitigation Strategies .....	252
11.3 The Role of Risk Modeling in Mitigation .....	254
11.4 Adopting Mitigation .....	255
11.5 Strategic Directions for Modeling Seismic Mitigation Strategies .....	256
References .....	259

<b>12 Visualizing Uncertainty in Natural Hazards.....</b>	<b>261</b>
12.1 Introduction .....	261
12.2 From Concepts to Representations.....	263
12.3 Uncertainty Visualization.....	269
12.4 Task-Oriented Visual Mappings.....	282
12.5 Hazards Visualization.....	285
12.6 Challenges .....	290
12.7 Acknowledgments .....	291
References .....	291
<b>13 Perspectives on Visualizing Uncertainty in Natural Hazards .....</b>	<b>295</b>
Introduction .....	295
13.1 Preferred Data Visualization Techniques May Not Lead to Comprehension and Use of Hazard Information.....	296
13.2 Putting Seismic Risk and Uncertainty on the Map.....	306
13.3 Keep Representations Simple for Effective Communication....	311
13.4 Strategic Directions for Visualizing Uncertainty in Natural Hazards.....	313
References .....	314
<b>14 Conclusion.....</b>	<b>319</b>
<b>Index .....</b>	<b>323</b>
<b>List of Contributing Authors.....</b>	<b>329</b>



<http://www.springer.com/978-3-540-71157-5>

Risk Assessment, Modeling and Decision Support

Strategic Directions

Bostrom, A.; French, S.P.; Gottlieb, S.J. (Eds.)

2008, XIV, 334 p., Hardcover

ISBN: 978-3-540-71157-5