

# Contents

1	Sustaining Our Ecosystems	1
1.1	Risk and Our Sustainable Future . . . . .	1
1.2	Building Adaptive Capacity and Opportunity . . . . .	54
1.3	Sustainability Frameworks, Metrics, and Indicators . . . . .	66
2	A Planet under Pressure	75
2.1	The Rise of Anthromes . . . . .	75
2.2	Stressed Ecosystems . . . . .	78
2.3	Perturbed Cycles . . . . .	82
2.4	Harmful Emissions . . . . .	100
2.5	Depletion of Finite Resources . . . . .	109
2.6	Crop Yield Gaps, Food Losses, and Wastes . . . . .	115
2.7	Future Sustainable Development Pathways . . . . .	123
3	Modeling Complex, Adaptive Systems	135
3.1	Systems Theory and Consilience . . . . .	135
3.2	Complex, Adaptive Systems (CAS) . . . . .	144
3.3	Alternative Approaches, Models, and Uses . . . . .	156
4	Real-World Application of Integrated Methods	181
4.1	Perspective . . . . .	182
4.2	Ecosystem Observation, Experimentation, and Modeling . . . . .	185
4.3	Geospatial Intelligence and Planning . . . . .	197
4.4	Integrating Causality . . . . .	226
4.5	Statistical Attributes of Integrated Risk . . . . .	229
4.6	Stochastic Sustainability . . . . .	232
4.7	Cumulative Impacts and Sensitive Trade-Offs . . . . .	241

<b>5 Future Outlook</b>	<b>253</b>
5.1 Perspective . . . . .	253
5.2 Transformation Paths and Transition Dynamics . . . . .	254
5.3 Causality and Forecasting . . . . .	260
5.4 Adaptive Science, Policy, and Institutions . . . . .	270
5.5 Public Good Science . . . . .	273
5.6 Super-Intelligent, Sustainability Tools . . . . .	275
<b>Acronyms</b>	<b>287</b>
<b>Glossary</b>	<b>291</b>
<b>Bibliography</b>	<b>301</b>
<b>Author Index</b>	<b>375</b>
<b>Subject Index</b>	<b>385</b>