## Contents

Foreword iii  
Acknowledgments iv  
Executive Summary v  
Explanatory notes xiv  
Acronyms and Abbreviations xvi  

**Chapter 1:** The shifting contours of the Asia-Pacific disaster riskscape 1  
**Chapter 2:** Managing disasters during a global pandemic 24  
**Chapter 3:** Hotspots of exposure to cascading risks 44  
**Chapter 4:** The scaled-up contours of a regional resilience response 67  

### Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
</table>
| Figure 1-1 | Number of fatalities and people affected in the Asia-Pacific region and the rest of the world, 1970–2020 | 2  
| Figure 1-2 | Number of fatalities and people affected in the Asia-Pacific region, 1970–2020 | 3  
| Figure 1-3 | Number of fatalities and people affected in ESCAP subregions, 2011–2020 | 4  
| Figure 1-4 | Average annual damage as a percentage of GDP, 1980–2018 | 4  
| Figure 1-5 | Wind speeds of tropical cyclones in the Western North Pacific, 1978–2018 | 5  
| Figure 1-6 | Number of fatalities and people affected by tropical cyclones in Asia and the Pacific, 1991–2020 | 5  
| Figure 1-7 | Number of consecutive dry days – projected change RCP 8.5, 2040–2059 | 6  
| Figure 1-8 | Number of fatalities and people affected by floods, 1991–2020 | 7  
| Figure 1-9 | Maximum five-day cumulative precipitation amount projected to return in a ten-year period, RCP 8.5, 2040–2059 | 8  
| Figure 1-10 | Projected change in number of days with temperature over 25°C, RCP 8.5, 2040–2059 | 8  
| Figure 1-11 | Confirmed dengue cases, 1990–2018 | 9  
| Figure 1-12 | Confirmed malaria cases, 2000–2017 | 10  
| Figure 1-13 | Monthly COVID-19 cases in Asia and the Pacific, 1 January 2020—6 June 2021 | 11  
| Figure 1-14 | COVID-19 and major disasters in 2020 and 2021 | 12  
| Figure 1-15 | Convergence of cyclone Amphan with the COVID-19 pandemic | 13  
| Figure 1-16 | Number of people in Asia and the Pacific affected by biological and other natural hazards, 2003–2020 | 15  
| Figure 1-17 | Types of disasters in Asia and the Pacific, 2000–2020 | 15  
| Figure 1-18 | Climate change exacerbates disaster risk | 18  
| Figure 1-19 | Impact of climate change on extreme weather conditions | 19  
| Figure 1-20 | Impacts of climate change on natural and other biological hazards | 21  
| Figure 2-1 | The Dharavi “chase the virus” model | 26  
| Figure 2-2 | Mapping the potential risk of COVID-19 spread in Jakarta, Indonesia | 27  
| Figure 2-3 | New Zealand – modelling the impact of lockdown | 28  


Figure 2-4  Population affected simultaneously by floods and COVID-19, in South Asia (June to July 2020) 29
Figure 2-5  More heatwaves but fewer deaths in Indian states, 2015–2020 30
Figure 2-6  Australia seven-day bushfires forecast on 15 January 2020 31
Figure 2-7  Populations exposed to sand and dust storms in East and North-East Asia, 15–18 March 2021 32
Figure 2-8  Locust swarms forming in spring 2020 33
Figure 2-9  Asia-Pacific countries vulnerable to climate hazards and social protection 34
Figure 2-10 A model of multi-hazard cascading risk and social vulnerabilities 35
Figure 2-11 Those most impacted by multi-hazard cascading risk 36
Figure 2-12 Populations with lower levels of human development at risk from cascading risks 36
Figure 2-13 Projected child malnutrition under the worst-case climate change scenario, selected countries 38
Figure 2-14 Proportion of women with limited access to health care under the worst-case climate change scenario, selected countries 39
Figure 2-15 A subregional analysis of disability prevalence and losses from multi-hazard cascading risks 40
Figure 2-16 Percentage of elderly population at risk from natural hazards under worst-case scenario 41
Figure 2-17 Displacement in Asia and the Pacific from natural hazards and other risks, 2015-2019 xii
Figure 3-1 Population exposure to heatwaves and related diseases under current and worst-case (RCP 8.5) scenarios in East and North-East Asia 46
Figure 3-2 Population exposure to heatwaves and related diseases, 2020–2059 47
Figure 3-3 Population exposure to drought and related diseases under current and worst-case (RCP 8.5) scenarios in North and Central Asia 48
Figure 3-4 Increase in population exposure to droughts and related diseases under current and worst-case (RCP 8.5) scenarios in North and Central Asia 49
Figure 3-5 Population exposure to floods and related diseases under current and worst-case (RCP 8.5) scenarios in South and South-West Asia 51
Figure 3-6 Population exposure to cyclones and related diseases under current and worst-case (RCP 8.5) scenarios in South and South-West Asia 52
Figure 3-7 Population exposure to floods and related diseases, millions, 2020–2059 53
Figure 3-8 Population exposure to drought and related diseases under current and worst-case (RCP 8.5) scenarios in South-East Asia 54
Figure 3-9 Increase in population exposure to drought and related diseases under current and worst-case (RCP 8.5) scenarios in South-East Asia 55
Figure 3-10 Multi-hazard risks from climate-related disasters and diseases under current and worst-case (RCP 8.5) scenarios in the Pacific small island developing States 56
Figure 3-11 Average population exposure to multiple hazards under moderate and worst-case climate change scenarios, percentage 57
Figure 3-12 Increase in Average Annual Losses (AAL) from cascading risks under current, moderate (RCP 4.5), and worst-case (RCP 8.5) climate change scenarios, US$ millions 58
Figure 3-13 Increase in Average Annual Losses (AAL) as a percentage of GDP under current, moderate (RCP 4.5), and worst-case (RCP 8.5) climate change scenarios 58
Figure 3-14 Annual Average Losses (AAL) from cascading hazards as a percentage of subregional GDP 59
Figure 3-15 Hospitals serving vulnerable people at risk from natural, biological and other health hazards under the worst-case (RCP 8.5) climate change scenario 60
Figure 3-16 Percentage of hospitals serving poor people at risk from natural, biological and other health hazards under the worst-case (RCP 8.5) climate change scenario 61
Figure 3-17 Electricity infrastructure exposed to multi-hazards under the worst-case (RCP 8.5) climate change scenario 62
Figure 3-18 Proportion of electrical grid and hydropower capacity at risk from multi-hazards under the worst-case (RCP 8.5) climate change scenario 62
Figure 4-1 Six characteristics of systemic risk 68
Figure 4-2 National adaptation strategies that include the health sector, by subregion 70
Figure 4-3  Priorities for the health sector identified by countries in national adaptation strategies, by subregion 70
Figure 4-4  Planning scenarios for the intersection of converging hazards and cascading risks 72
Figure 4-5  Vulnerable populations in Bangladesh 73
Figure 4-6  India’s Digital Health Framework 75
Figure 4-7  Adaptation cost estimates by United Nations Framework Convention on Climate Change and the Intergovernmental Panel on Climate Change 77
Figure 4-8  Subregional adaptation costs for climate-related hazards and biological hazards, percentage of GDP 79
Figure 4-9  Adaptation costs under RCP 8.5 for countries in the Pacific, as a percentage of GDP 80
Figure 4-10 Adaptation costs under RCP 8.5 for the Least Developed Countries, percentage of GDP 80
Figure 4-11 Adaptation priorities for ESCAP subregions 84

Tables
Table 1-1  Dengue outbreaks in 2019 10
Table 1-2  Number of people affected by the COVID-19 pandemic and natural hazards in the Asia-Pacific subregions 13
Table 2-1  Key actions for shock-responsive social protection programme 35
Table 2-2  Countries with the highest proportions of their poorest population exposed to multi-hazard cascading risk (current and two climate scenarios) 37
Table 3-1  Average Annual Losses (AAL) from the new expanded riskscape under moderate (RCP 4.5) and worst-case (RCP 8.5) climate change scenarios 57
Table 4-1  Cost estimates for climate adaptation, infrastructure resilience and sustainable development 77
Table 4-2  Annual adaptation cost under RCP 8.5 by subregion, billions of US dollars 78
Table 4-3  Estimated adaption costs compared with intended national determined contributions (INDCs) 81
Table 4-4  Adaptation priorities for ESCAP subregions 85

Boxes
Box 1-1  Cascading hazards 14
Box 1-2  Natural disasters, climate change and the emergence of fungal pathogens 17
Box 3-1  Representative Concentration Pathways (RCPs) 45
Box 3-2  Cyclone Tauktae — a manifestation of the emerging riskscape 50
Box 3-3  Sand and dust storms and human health 63
Box 4-1  The Sendai Framework and the Bangkok Principles 71
Box 4-2  Building back better after the Indian Ocean tsunami 72
Box 4-3  AI-based next generation flood forecasting 74
Box 4-4  The Pacific Disaster Risk Financing and Insurance Program 79
Box 4-5  Forecasting cascading risk scenarios at different time scales 82
Box 4-6  Philippines Natural Disaster Risk Insurance Policy 86
Box 4-7  Adaptation Priorities in the Pacific small island developing States 88
Box 4-8  COVID-19 vaccination in Asia and the Pacific 90
Box 4-9  Critical infrastructure services: key policy innovations for future pandemic 91
Box 4-10 Scenario planning in the coastal city of Visakhapatnam, India 92
Box 4-11 Melbourne Water’s Industry Climate Change Committee 93