



Praise for the First Edition:

*'Professor Bryant's heroic compilation is an excellent guide.'*

— SCIENTIFIC AMERICAN

Natural hazards afflict all corners of the Earth; often unexpected, seemingly unavoidable and frequently catastrophic in their impact.

This revised edition is a comprehensive, inter-disciplinary treatment of the full range of natural hazards. Accessible, readable and well supported by over 150 maps, diagrams and photographs, it is a standard text for students and an invaluable guide for professionals in the field.

Clearly and concisely, the author describes and explains how hazards occur, examines prediction methods, considers recent and historical hazard events and explores the social impact of such disasters. This revised edition makes good use of the wealth of recent research into climate change and its effects.

EDWARD BRYANT is Associate Dean of Science at Wollongong University in Australia. Among his other publications is *Tsunami: The Underrated Hazard* (Cambridge University Press, 2001). He has particular interest in climatic change and coastal evolution.

COVER DESIGN: Elizabeth Dias

COVER PHOTOGRAPHS: Newspix/AFP/Fernando Morales

CAMBRIDGE  
UNIVERSITY PRESS  
[www.cambridge.org](http://www.cambridge.org)

ISBN 0 521 53743-6



9 780521 537438 >



# Contents

List of illustrations	ix	Dust storms	78
Preface	xiii	Concluding comments	83
Acknowledgements	xv	References and further reading	83
<b>1 Introduction to Natural Hazards</b>	<b>1</b>	<b>4 Localized Storms</b>	<b>85</b>
Rationale	1	Introduction	85
Historical background	2	Thunderstorms, lightning and hail	85
Chapter outlines	10	Tornadoes	93
References and further reading	13	Concluding comments	102
		References and further reading	102
<b>Climatic Hazards</b>		<b>5 Drought as a Hazard</b>	<b>103</b>
<b>2 Mechanisms of Climate Variability</b>	<b>17</b>	Introduction	103
Introduction	17	Pre-colonial response to drought	103
Models of atmospheric circulation and change	17	Post-colonial response	105
Astronomical cycles	37	Drought conditions exacerbated by modern societies	106
Concluding comments	41	Modern response to droughts	106
References and further reading	42	International response	113
		Private responses: Bob Geldof	115
<b>3 Large-scale Storms as a Hazard</b>	<b>44</b>	Concluding comments	118
Introduction	44	References and further reading	119
Tropical cyclones	44	<b>6 Flooding as a Hazard</b>	<b>120</b>
Extra-tropical cyclones	58	Introduction	120
Snowstorms, blizzards and freezing rain	67	Flash floods	120
Storm surges	73	High-magnitude, regional floods	131
Probability of occurrence	76		



Concluding comments	137	Concluding comments	224
References and further reading	137	References and further reading	225
<b>7 Fires in Nature</b>	<b>139</b>	<b>11 Volcanoes as a Hazard</b>	<b>227</b>
Introduction	139	Introduction	227
Conditions favoring intense bushfires	140	Types of volcanic eruptions	229
Causes of fires	143	Volcanic hazards	230
Bushfire disasters: world perspective	144	Volcanic disasters	238
Concluding comments	153	Concluding comments	247
References and further reading	154	References and further reading	247
<b>8 Oceanic Hazards</b>	<b>155</b>	<b>12 Land Instability as a Hazard</b>	<b>249</b>
Introduction	155	Introduction	249
Waves as a hazard	156	Soil mechanics	249
Sea-ice as a hazard	162	Shear strength of soils	251
Sea level rise as a hazard	166	Classification of land instability	254
Beach erosion hazard	170	Subsidence	267
Concluding comments	174	Concluding comments	268
References and further reading	175	References and further reading	269
<b>Geological Hazards</b>		<b>Social Impact</b>	
<b>9 Causes and Prediction of Earthquakes and Volcanoes</b>	<b>179</b>	<b>13 Personal and Group Response to Hazards</b>	<b>273</b>
Introduction	179	Introduction	273
Scales for measuring earthquake intensity	179	Before the event	273
Distribution of earthquakes and volcanoes	182	Dealing with the event and its aftermath	277
Causes of earthquakes and volcanoes	184	Additional impacts	283
Prediction of earthquakes and volcanoes	189	References and further reading	286
Concluding comments	200	<b>14 Epilogue</b>	<b>288</b>
References and further reading	200	Changing hazard regimes	288
<b>10 Earthquakes and Tsunami as Hazards</b>	<b>202</b>	Modern consequences of natural hazards	290
Types of shock waves	202	References and further reading	291
Seismic risk maps	204	Select glossary of terms	292
Earthquake disasters	204	Index	304
Liquefaction or thixotropy	211		
Tsunami	214		