

Contents

Preface	xi
Acknowledgements	xiv

PART I INTRODUCING TOPOGRAPHY 1

Chapter 1 Topography, the toposphere, and the environment	3
What is topography?	3
What is the role of topography as an environmental factor?	4
Locational factors	4
Structural factors	7
What is the toposphere?	9
The physical toposphere	10
The biological toposphere	11
References	11
Chapter 2 Characterising topography	13
Topographic elements	13
Locating places	13
Characterising places	14
Physical landscape units – landform elements	19
Ecological landscape units – landscape elements	23
Topographic structures	27
Networks	27
Mosaics and regions	32
Measuring landscape elements and mosaics	33
Topographic connections	35
Local and regional flows	35
Global flows	36
Isolation in a fully connected world	36
References	37

PART II TOPOGRAPHIC INFLUENCES**43**

Chapter 3	Climate	45
	Modelling climatic phenomena	46
	Modelling precipitation	46
	Modelling temperature	49
	Solar radiation modelling	50
	Multi-climate parameter models	53
	Altitude and climate	53
	Pressure and temperature	53
	Rain and snow	56
	Local climates (topoclimates)	59
	Topoclimatic features	61
	Small-scale mechanical airflow modification	64
	Small-scale thermal airflow modification	69
	Synoptic-scale climates	72
	Synoptic-scale airflow modification	72
	Fall winds	74
	Compensating winds	76
	Topography and climate: global connections	82
	Mountain-building and global climate	82
	Climate and the arrangement of land and sea	84
	References	84
Chapter 4	Water	91
	The hydrological cycle	91
	Hillslope hydrology	92
	Evapotranspiration	92
	Channel runoff	94
	The drainage basin	96
	Catchment runoff	96
	Drainage basin morphometry	96
	Channel networks	101
	Channel initiation	101
	Open channel flow	103
	Automatic derivation of catchment characteristics	105
	Catchment boundary and stream network delineation	106
	Derivation of the other hydrological parameters	109
	Accuracy of derived catchment attributes	110
	The global cycle	112
	Global hydrological change	113
	Hydrology and climatic change	115
	References	117
Chapter 5	Soil and sediments	122
	Soil and altitude	122
	Altitudinal soil sequences	122
	Altitudinal geomorphic zones	128

PART II TOPOGRAPHIC INFLUENCES		43
Chapter 3	Climate	45
	Modelling climatic phenomena	46
	Modelling precipitation	46
	Modelling temperature	49
	Solar radiation modelling	50
	Multi-climate parameter models	53
	Altitude and climate	53
	Pressure and temperature	53
	Rain and snow	56
	Local climates (topoclimates)	59
	Topoclimatic features	61
	Small-scale mechanical airflow modification	64
	Small-scale thermal airflow modification	69
	Synoptic-scale climates	72
	Synoptic-scale airflow modification	72
	Fall winds	74
	Compensating winds	76
	Topography and climate: global connections	82
	Mountain-building and global climate	82
	Climate and the arrangement of land and sea	84
	References	84
Chapter 4	Water	91
	The hydrological cycle	91
	Hillslope hydrology	92
	Evapotranspiration	92
	Channel runoff	94
	The drainage basin	96
	Catchment runoff	96
	Drainage basin morphometry	96
	Channel networks	101
	Channel initiation	101
	Open channel flow	103
	Automatic derivation of catchment characteristics	105
	Catchment boundary and stream network delineation	106
	Derivation of the other hydrological parameters	109
	Accuracy of derived catchment attributes	110
	The global cycle	112
	Global hydrological change	113
	Hydrology and climatic change	115
	References	117
Chapter 5	Soil and sediments	122
	Soil and altitude	122
	Altitudinal soil sequences	122
	Altitudinal geomorphic zones	128

Soil and aspect	131
Soil and slopes	132
Soils and slope form	132
Soils and hillslope hydrology: current processes	139
Soils and hillslope hydrology: reconstruction techniques	142
Sediments and hillslopes	148
Soil landscapes	149
Dynamic soil–landscape models	149
Soil processes and soil types in landscapes	152
Sediments in landscapes	154
Soil erosion modelling	155
Background to soil erosion models	155
Empirical soil erosion models	155
Non-spatial, physically based soil erosion models	156
Spatial, physically based soil erosion models	157
References	159
Chapter 6 Animals and plants	164
Life and altitude	164
Altitudinal floral zones	164
Altitudinal faunal zones	169
Tree-lines	171
Plant species and altitude	175
Animal species and altitude	180
Life and landform	183
Aspect and plants	183
Aspect and animals	186
Slopes	187
Microtopographic influences of animals and plants	193
Surfaces	196
Integrated topographic effects	197
Landscape patches	200
Patch size	200
Patch shape	204
Patch edges	207
Corridors	210
Roads and trails	210
Powerlines	212
Hedgerows and other wooded strips	213
Stream and river corridors	213
Networks	214
Tree networks and life	214
Corridor and circuit networks	216
Mosaics	218
Landscape structure and connectivity	218
Landscape properties	222
References	225

Chapter 7	Humans	232
	Settlements	232
	The nature of settlement	232
	Physical influences	233
	Cultural, social, and economic influences	241
	Routes	242
	Maintaining routes	242
	Environmental impacts of routes	243
	Agriculture	244
	Aspect	245
	Shelterbelts	245
	Land-use catenas	246
	Agricultural mosaics	248
	Environmental destruction and conservation	250
	Reserve distribution	250
	Reserve shape	251
	Conservation corridors	252
	Reserve edges	253
	Reserve functioning	253
	Regional reserve setting	253
	Human individuals and populations	254
	Terrain and military history	255
	Topography, climatic change, and tourism	257
	Agroforestry and ecosystem management	257
	References	259
	Index	263

Preface

Topography is at once a fundamental and a subtle environmental factor. It wields large and small influences over all other factors of the ecosphere – climate, water storage and movement, soils, animals and plants, and human activities. Several conspicuous topographic influences are well known. Most readers will be aware that a hike up a mountain is the climatic equivalent of a trek from a lower to a higher latitude. They will also be familiar with the stark climatic and botanical contrasts between north-facing and south-facing slopes in the European Alps. Subtle influences are not so well known but are equally significant. In the French Alps, slope exposure affects alpine marmots' habitat preferences and growth rates. Problems of air pollution in Mexico City are associated with poor ventilation and local and regional wind systems that are largely under topographic control. Sea-floor topography may subtly alter marine processes. On 17 July 1998, a magnitude 7.1 earthquake spawned three tsunamis (tidal waves) whose size would normally be associated with a larger quake. The 15-m waves killed more than 2200 people living along Papua New Guinea's north coast. The waves may have grown abnormally large due to the three-dimensional topography of the nearby sea-floor. Equally, seismic vibrations may have triggered submarine landslides or gas explosions that could have given the waves a boost.

In the present book we investigate the basic and refined effects of topography upon other environmental factors – climates, surface water, soils and sediments, animals and plants, and humans. In doing so, we pinpoint four aspects of topography as an environmental factor. First, we acknowledge a corpus of work that limits topography to the physical ground surface. Workers in this field are largely physical geographers, and in particular geomorphologists who are principally interested in the characterisation and evolution of land form. Second, we recognise a renaissance of the venerable idea of topography as 'all the features of the Earth's surface', including human-made features. The language of the landscape ecologists now focuses around patch, corridor, and matrix. These are all crucial topographic elements that affect microclimates, the abundance and distribution of animals and plants, and conservation strategies. Third, we note a rapid emergence of topographically based modelling, developed in association with geographical information systems. With software packages and powerful computing facilities readily available, topographically based modelling is increasingly applied in a range of disciplines concerned with the Earth's surface environment. Fourth, we

perceive a thriving interest in topographic location – place – as a human construct. Some researchers are interested not just in the character of a particular place (its location and structure), but also in how people perceive it and respond to it (its perceptual and cultural meaning). The book explores all four aspects of topography, with the first three taking the lion's share of the text. The idea of place as a human construct is an immense topic and is touched upon in relation to cultural, social, and economic influences upon settlement location and in relation to agroforestry and ecosystem management.

The book is divided into two parts. Part I introduces topography and Part II explores individual topographic influences on various environmental factors. Part I comprises two chapters. Chapter 1 discusses the nature of topography, the role of topography as an environmental factor, and the nature of the toposphere. Chapter 2 looks at the description of topography, discussing topographic elements (locational parameters, digital elevation data, and physical and ecological landscape units), topographic structures (networks, mosaics, and regions), and topographic connections (local and regional flows, global flows, and isolation in a connected world). Part II consists of five chapters. Chapter 3 examines topographic influences upon climates. It considers the modelling of climatic factors using topographic data; climatic variations with altitude; local climates (topoclimates), including urban heat-islands, small-scale topographic alteration of airflow, and local winds; synoptic-scale climates, including fall winds and compensating winds; and global topographic connections, including the effects of mountain chains and plateaux. Chapter 4 investigates topographic influences on water. It studies the hydrology of hillslopes, drainage basins, and channel networks at local, regional, and global scales, as well as the automated derivation of catchment characteristics. Chapter 5 probes topographic influences upon soils, examining altitude and soils (altitudinal climosequences, geomorphic zones on mountains), aspect and soils, soils and slopes, soil landscapes, and soil erosion. Chapter 6 considers topographic influences upon life. It looks at altitude and life, including life zones, tree-lines, and altitudinal species ranges; land form and life, including aspect, slope, microtopography, and surfaces; landscape patches (patch size, patch shape, and patch edges), corridors (roads and trails, powerlines, hedgerows, and streams and rivers), networks (tree networks, corridor and circuit networks), and mosaics (landscape structure and connectivity and landscape properties). Chapter 7 examines how topography exerts an influence on the location of settlements, routes, agriculture, environmental destruction and conservation, and human individuals and populations, which includes terrain and military campaigns.

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