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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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