1

Defining Geodiversity

*If the Lord Almighty had consulted me before embarking upon creation, I should have recommended something simpler.*

Alfonso X, King of Castile and Leon (1252–1284), quoted in Mackay (1991)

1.1 A diverse world

Let us begin by imagining the very simplest of planets (see Figure 1.1). A planet composed of a single monomineralic rock such as a pure quartzite. A planet that is a perfect sphere with no topography and where there is no such thing as plate tectonics. Although it has weather, this is very similar everywhere with solid cloud cover, light rain and no winds, so that there is little variation in surface processes or weathering. Consequently the soil is also very uniform. The absence of gradients and surface processes means that there is little erosion, transportation or deposition of sediments. This planet has seen few changes in its 4.6 thousand million year history and there is, in any case, no sedimentary record of these changes. To say the least, this is not a diverse or dynamic planet.

It has to be admitted that our imagined planet has certain attractions. In fact, Alfonso X was a forerunner of many Medieval and Renaissance writers who deplored the rough and disorderly shape of the Earth and ‘infestation by mountains which prevented it from being the perfect sphere that God must surely have intended to create’ (Midgley, 2001, p.7). Furthermore, there are no natural hazards such as earthquakes or avalanches to cause death and destruction. Civil engineering is very simple given the predictability of the ground conditions. Walking is easy with no gradients to negotiate or rivers to cross. But think of the disadvantages. In a planet made entirely of quartz there are no metals and therefore no metallic products. And in any case, since there is no coal, oil or natural gas, and no geothermal, wave, tidal or wind power, the energy to produce any goods or electricity is lacking. Everywhere looks the same so getting lost is easy and there is no sense of place. Employment and entertainment are limited, given the absence of materials and lack of environmental diversity. The quartzite
is too hard and massive to quarry in the absence of mechanical equipment or explosives, so the buildings are primitive, being constructed from soil and the simple vegetation types that exist on our planet. For in the absence of physical diversity and habitat variation, little biological evolution of advanced plants and animals has been able to take place. This means that we humans would probably not exist on this planet, but if we did we would certainly find this to be a very primitive and boring place.

Thankfully our world is not like this. It is highly diverse in almost all senses—physical, biological and cultural—and although this produces problems for society and even conflicts and war, would we really want a less diverse and interesting home? The diversity of the physical world is huge and humans have put this diversity to good use even if we often fail to fully appreciate this fact. Diversity also brings with it flexibility of technologies and a greater ability to adapt to change.

Although our medieval ancestors hated the physical chaos of the Earth, our modern aesthetic appreciation of planetary diversity is probably deeply buried
in our evolutionary psyche so that we often value it more than uniformity. The broad diversity of places, materials, living things, experiences and peoples not only makes the world a more useful and interesting place, but probably also stimulates creativity and progress in a wide range of ways. Diversity therefore brings a range of values, and it is the thesis of this book that things of value ought to be conserved if they are threatened. And, as we shall see, there are many threats to planetary diversity induced by human actions both directly and indirectly.

The term ‘conservation’ is used in preference to ‘preservation’ in this book since the latter implies protection of the status quo, whereas nature conservation must allow natural processes to operate and natural change to occur. Unfortunately, human action has often accelerated or tried to stop natural processes, and has thus destroyed much that is valuable in the natural environment. While change through human action is inevitable, we should at least understand the consequences of our actions and hopefully minimise the impacts and losses. Conservation is therefore about the management of change.

In the Preface to the first edition of this book I referred to a growing respect for diversity and a realisation that there is value in difference. Since then, the ‘diversity’ agenda has taken hold and there has been a blossoming appreciation for the value of local environmental, social and cultural distinctiveness and diversity. This book represents an undervalued aspect of this trend and aims to raise the profile of ‘geodiversity’.

1.2 Biodiversity

Nowhere has the trend towards the value of diversity been more evident than in the field of biology. In recent decades the growing concern about species decline and extinction, loss of habitats and landscape change led to a realisation of the multi-functioning nature of the biosphere. For example it acts as a source of fibre, food and medicines, it sustains concentrations of atmospheric gases, it buffers environmental change and it contains millions of species of plants and animals, most of which have unknown value and ecosystem function and deserve respect in their own right. Yet of the 1.5–1.8 million known species, it is estimated that up to a third could be extinct in the next 30 years (Grant, 1995).

Concern for species and habitat loss led to some important international environmental agreements and legislation including the Ramsar Convention on wetland conservation (1971), Convention on International Trade in Endangered Species (CITES) (1973) and the Bonn Convention on Conservation of Migratory Species (1979). More recently the European Union has played an active role in biological conservation, for example through the Habitats Directive and Birds Directive.

An International Convention on Biological Diversity was first proposed in 1974 and during the 1980s the phrase ‘biological diversity’ started to be shortened to biodiversity. An important meeting of the US National Forum on Biodiversity took place in Washington DC in 1986 under the auspices of the American National Academy of Sciences and Smithsonian Institution. The conference
papers (Wilson, 1988) mark an important milestone in the history of nature conservation and caused the issue to be taken seriously by politicians both inside and beyond America.

International recognition of the need for biosphere conservation led to the UN Convention on Biodiversity agreed at the Rio Earth summit in 1992, ratified in 1994 and signed by over 160 countries. The agreement was far reaching and the main features are listed in Table 1.1. Since then great attention has been given at international, national, regional and local levels to protecting and enhancing the biological diversity of the planet. These are usually classified into genetic diversity (conserving the gene pool), species diversity (reducing species loss) and ecosystem diversity (maintaining and enhancing habitats and their biological systems). And biodiversity is not just about numbers of species or ecosystems but about the countless interconnections between them. A wealth of strategies and action plans are being implemented to carry forward the aims of the UN Convention. Every signatory country must prepare a national plan for conserving and sustaining biodiversity, has a responsibility for safeguarding key ecosystems and is responsible for monitoring genetic stock. International designations include Ramsar sites (under the Ramsar Convention) Special Protection Areas (under the European Union Birds Directive) and Special Areas for Conservation (under the European Union Habitats Directive). The International Union for Nature Conservation (IUCN) has helped over 75 countries to prepare and implement national conservation and biodiversity strategies. Jerie, Houshold and Peters (2001, p. 329) have referred to this as ‘the torrent of effort being put into the management of biodiversity’. Even some ecologists have spoken of the obsession with loss of species and habitats rather than focusing on the more important issue of functional significance of species in a variety of ecosystems (Dolman, 2000).

In the UK, Biodiversity: the UK Action Plan (HMSO, 1994), Working with the Grain of Nature, a biodiversity strategy for England (DEFRA, 2002a), Conserving Biodiversity—the UK approach (DEFRA, 2007) and Biodiversity 2020 (DEFRA, 2011a) have been supplemented by many regional and local

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<th>Table 1.1</th>
<th>Main features of the Convention on Biological Diversity (after Mather and Chapman, 1995).</th>
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<tr>
<td>•</td>
<td>Development of national plans, strategies or programmes for the conservation and sustainable use of biodiversity.</td>
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<td>Inventory and monitoring of biodiversity and of the processes that impact on it.</td>
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<td>•</td>
<td>Development and strengthening of the current mechanism for conservation of biodiversity both within and outside protected areas, and the development of new mechanisms.</td>
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<td>Restoration of degraded ecosystems and endangered species.</td>
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<td>Preservation and maintenance of indigenous and local systems of biological resource management and equitable sharing of benefits with local communities.</td>
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<td>Assessment of impacts on biodiversity of proposed projects, programmes and policies.</td>
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<td>•</td>
<td>Recognition of the sovereign right of states over their natural resources.</td>
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<td>•</td>
<td>Sharing in a fair and equitable way the results of research and development and the benefits arising from commercial and other utilisation of genetic resources.</td>
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<td>Regulation of the release of genetically modified organisms.</td>
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initiatives including Local Biodiversity Action Plans (LBAPs), Species Recovery Programmes (SRPs) and Habitat Action Plans (HAPs). These are being implemented by the national conservation bodies (Natural England, Scottish Natural Heritage, Natural Resources Wales, Northern Ireland Environment Agency) in collaboration with local authorities and a wide range of wildlife and conservation organisations (e.g. County Wildlife Trusts, Royal Society for the Protection of Birds, Campaign to Protect Rural England). By 2009 there were 1150 priority species and 65 priority habitats in the UK. In addition, Section 40 of the Natural Environment and Rural Communities Act (2006) requires all public bodies in England and Wales to have regard to biodiversity when carrying out their functions, and is now referred to as the ‘biodiversity duty’.

About 100 books have appeared with ‘biodiversity’ in the title (from Wilson, 1988 to Waterton, Ellis and Wynne, 2012). Wilson (1997, p. 1) refers to ‘biodiversity’ as ‘one of the most commonly used expressions in the biological sciences and has become a household word’. ‘Biodiversity science’ and ‘biodiversity studies’ have been born and the origin and maintenance of biodiversity ‘pose some of the most fundamental problems of the biological sciences’ (Wilson, 1997, p. 2). The Rio+20 conference in 2012 confirmed the importance of biodiversity and the threats to it.

1.3 Geodiversity

Geological and geomorphological conservation (geoconservation) have a long history. In 1668 the Baumannshöhle cave in Germany was the subject of a nature conservation decree by Duke Rudolf August (Erikstad, 2008). In the first 20 years of the nineteenth century the quarrying of stone from Salisbury Crags in Edinburgh, Scotland, was having such a serious impact on the city landscape that legal action was taken in 1819 to prevent further deterioration (McMillan, Gillanders and Fairhurst, 1999; Thomas and Warren, 2008). An erratic boulder in Neuchâtel, Switzerland was protected in 1838 (Reynard, 2012). The first geological nature reserve in the world was established at Drachenfels/Siebengebirge in Germany in 1836 and other German hills were protected at Totenstein (1844) and Teufelsmauer (1852). Yosemite was protected by the State of California, United States, in 1864 and Yellowstone was established as the world’s first National Park in 1872 largely for its scenic beauty and geological wonders (see Box 6.1). Also in the 1870s, Fritz Muhlberg campaigned to protect giant erratic boulders in Switzerland that were being exploited as kerbstones (Jackli, 1979), and in Scotland the ‘Boulder Committee’ was established, under the direction of David Milne Home, to identify all remarkable erratics and to recommend measures for their conservation (Milne Home, 1872a, 1872b; Gordon, 1994). Some of the first specific geological sites to be protected were also in Scotland where City Councils acted to enclose Agassiz Rock striations in Edinburgh (1880) and the Fossil Grove Carboniferous lycopod stumps in Glasgow (1887). Other initiatives have followed and many countries now have areas and sites protected at least partially for their geological or landscape interest. But despite many international conferences and books in the past 20 years (e.g. G. Martini, 1994; O’Halloran
et al., 1994; Stevens et al., 1994; Wilson, 1994; Barrentino, Vallejo and Gallego, 1999; Gordon and Leys, 2001a; Gray, 2004; Burek and Prosser, 2008; Brocx, 2008; Wimbledon and Smith-Meyer, 2012), in most countries geoconservation is weakly developed and lags severely behind biological conservation.

Geologists and geomorphologists started to use the term ‘geodiversity’ in the 1990s to describe the variety within abiotic nature. The major attention being given to biodiversity and wildlife conservation was simply reinforcing the longstanding imbalance within nature conservation policy and practice between the biotic and abiotic elements of nature. Although geological and geomorphological conservation had been practised for over 100 years, these were usually the ‘Cinderella’ of nature conservation (Gray, 1997a). Many international nature conservation organisations, although using the general term ‘nature conservation’ appeared to see this as synonymous with ‘wildlife conservation’ and focused most or all of their attention on the latter. Milton (2002, p. 115) summarised the situation well in stating that ‘Diversity in nature is usually taken to mean diversity of living nature . . . ’. Pemberton (2001a) believed that nature conservation agencies and governments across Australia, and overseas, ‘tend to emphasize the need for the conservation of biodiversity whilst virtually ignoring the geological foundation on which this is built and has evolved’. He attributed this to the lack of training of earth scientists in geoconservation theory, policy and practice. He made the interesting observation that ‘The majority of earth scientists are trained and employed in the extractive industries. To be involved in conservation could be seen to be contrary to the goals of the profession . . . ’ and he compares this with the biological sciences where conservation is a major graduate employer. ‘This has generally meant that geoconservation has remained something of an oddity, divorced from mainstream nature conservation, and so it has generally had low priority within land management agencies’ (Pemberton, 2001a). Although geoconservation has not yet been accorded great prominence in Australian nature conservation, Kiernan (1996, p.6) believed that ‘few professional land managers would, having been made aware that a particular landform was, say, the only example in Australia of its type, seriously argue against the validity of safeguarding it, just as they would wish to safeguard the continued existence of a biological species.’

A similar situation has existed in the United Kingdom, where although geoconservation policy and practice have long been actively pursued and developed by several groups and organisations, this has not always been recognised by the wider nature conservation community or public. Therefore, some geologists and geomorphologists saw ‘geodiversity’ not only as a very useful new way of thinking about the abiotic world, but also as a means of promoting geoconservation and putting it on a par with wildlife conservation (Prosser, 2002a). An example of using ‘nature’ and ‘wildlife’ synonymously came in Sir John Lawton’s report (2010) Making Space for Nature which was subtitled A review of England’s wildlife sites and ecological network. Sadly and amazingly, it was followed by a government White Paper on the natural environment The Natural Choice: Securing the Value of Nature (DEFRA, 2011b), that manages, in its 76 pages, to discuss nature in England and Wales without once referring to geology, geomorphology or geodiversity!
In the United States, most nature conservation effort has been directed through the national parks system, and although several units of the system have been established for their geological or geomorphological interest (see Section 9.2.1), this is not always recognised. For example, Sellars' (1997) eloquent history of nature conservation in the US National Parks is almost entirely dominated by wildlife issues, reflecting the major concerns of the parks system over the past 140 years.

It is difficult to trace the first usage of the term ‘geodiversity’, and indeed it is likely that several earth scientists coined the term independently, as a natural twin to the term ‘biodiversity’. Once the Convention on Biodiversity popularised the word and concept of ‘biodiversity’ in 1992, it became difficult to avoid noting that there is an abiotic equivalent. The early history of geodiversity was reviewed by Gray (2008a) who noted that the first use of the principle of geological diversity and its relevance to geoconservation pre-dates the Convention on Biodiversity. Kevin Kiernan, working for the Tasmanian Forestry Commission in the 1980s was using the terms ‘landform diversity’ and ‘geomorphic diversity’ and drawing parallels with biological concepts by using terms such as ‘landform species’ and ‘landform communities’ (K. Kiernan, pers. comm.). In one seminar paper in 1991, he pointed out that ‘The diversity among landforms is just as valid a target as the diversity of life when developing nature conservation programs. . . .’ (Kiernan, 1991), a remark that was certainly prophetic. The term ‘geodiversity’ appears to have been first used by F.W. Wiedenbein in a German publication in April 1993 (see Wiedenbein, 1993, 1994), closely followed by Sharples in Tasmania in October of the same year (Sharples, 1993). Subsequently it became widely adopted in studies of geological and geomorphological conservation in Tasmania in particular (Kiernan, 1994, 1996, 1997a; Dixon, 1995, 1996a, 1996b).

Sharples (1993) used it to cover ‘the diversity of earth features and systems. He also stresses (Sharples, 2002a) the importance of distinguishing the terms ‘geodiversity’, ‘geoconservation’ and ‘geoheritage’. He defines them as follows:

- ‘geodiversity’ is the quality we are trying to conserve,
- ‘geoconservation’ is the endeavour of trying to conserve it, and
- ‘geoheritage’ comprises concrete examples of it that may be specifically identified as having conservation significance.

The most important landmark for geoconservation in Australia was adoption of the Australian Natural Heritage Charter in 1996 and subsequently updated in 2002 (Australian Heritage Commission, 1996, 2002), which has the term and substance of geodiversity interwoven throughout its Articles (see Section 12.6). As a result, geodiversity is now a widely used and understood term in Australian nature conservation. However, Joyce (1997, p. 39) is critical of the term ‘geodiversity’ since it ‘. . . may be attempting to draw too strong a parallel between sites, landscape features and processes in biology and geology’. This issue is discussed in Section 14.1.

In 1995, Ibáñez, De-Alba and Boixadera (1995a), Ibáñez et al. (1995b) and McBratney (1995) started to use the word ‘pedodiversity’ to describe the diversity of soils as an abiotic component of global geodiversity (Ibáñez et al., 1998).
In the United Kingdom, Gray (1997a, p. 323) suggested that ‘perhaps one day we will see ... a Geodiversity Action Plan for the UK to rank alongside its biological counterpart’ and this was launched in September 2011, partly to give a national frameworks for the many Local Geodiversity Action Plans (LGAPs) now published in the country (see Section 12.5). Stanley (2004, p. 48) argued that ‘biodiversity is merely part of Geodiversity’ and proposed a wide definition (see Table 1.2). Prosser (2002a, 2002b), in useful discussions of terminology, accepted the validity of the term ‘geodiversity’ and it has now become widely used throughout the United Kingdom.


### Table 1.2 Some definitions of geodiversity.

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<td>Semeniuk (1997), Brocx (2008)</td>
<td>‘the natural variety of geological, geomorphological, pedological, hydrological features of a given area, from the purely static features at one extreme, to the assemblage of products, and at the other, their formative processes’</td>
<td>An area-based definition. Note also the inclusion of hydrological features</td>
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<td>Johansson et al. (2000)</td>
<td>‘the complex variation of bedrock, unconsolidated deposits, landforms and processes that form landscapes ... Geodiversity can be described as the diversity of geological and geomorphological phenomena in a defined area’</td>
<td>Note the emphasis on landscapes and defined area.</td>
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<td>Nieto (2001)</td>
<td>‘the number and variety of structures (sedimentary, tectonics, etc.), geological materials (Minerals, rocks, fossils and soils) that make up the terrain of a region, in which organic activity takes place, including anthropic’</td>
<td>Another area-based definition. Note also the inclusion of the relevance to biodiversity and human activity.</td>
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<td>Stanley (2001)</td>
<td>‘the link between people, landscapes and culture; it is the variety of geological environments, phenomena and processes that make those landscapes, rocks, minerals, fossils and soils which provide the framework for life on Earth’</td>
<td>A thematic definition strongly linked to human activity and biodiversity. Note also reference to landscapes.</td>
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1.3 GEODIVERSITY

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<th>Authors</th>
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<td>Kozlowski (2004)</td>
<td>‘the natural variety of the Earth’s surface, referring to geological and geomorphological aspects, soils and surface waters, as well as to other systems created as a result of both natural (endogenic and exogenic) processes and human activity’</td>
<td>Note the inclusion of surface hydrology and the link with human activity.</td>
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<td>Gray (2004)</td>
<td>‘the natural range (diversity) of geological (rocks, minerals, fossils), geomorphological (land form, physical processes) and soil features. It includes their assemblages, relationships, properties, interpretations and systems’</td>
<td>A thematic definition. Note reference to interpretations.</td>
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<td>Spanish ‘Natural Heritage and Biodiversity’ National Law (2007)</td>
<td>‘the variety of geological features, including rocks, minerals, fossils, soils, landforms, landscapes, geological formations and units, that are the product and record of the Earth’s evolution’</td>
<td>A thematic definition. Note reference to landscapes and Earth history.</td>
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<td>Serrano and Ruiz-Flano (2007)</td>
<td>‘the variability of abiotic nature, including lithological, tectonic, geomorphological, soil, hydrological, topographical elements and physical processes on the land surface and in the seas and oceans, together with systems generated by natural, endogenous and exogenous, and human processes which cover the diversity of particles, elements and places’</td>
<td>A thematic definition, but note the inclusion of hydrology, seas and oceans and scale factors.</td>
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<tr>
<td>Burek and Prosser (2008)</td>
<td>‘the variety of rocks, minerals, fossils, landforms, sediments and soils, together with the natural processes which form and alter them’</td>
<td>A thematic definition.</td>
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book on the geodiversity of the Nordic countries, and an English summary was produced in 2003 (Nordic Council of Ministers, 2003). Erikstad and Stabbertorp (2001) used the term in relation to natural areas and environmental impact assessment, and it appears now to be in common usage in the Scandinavian countries. A few authors in Europe (e.g. Panizza, 2009) have begun using the term ‘geomorphodiversity’ (geomorphological diversity) but this seems an unnecessary addition to the already overly complex geoconservation terminology.

Apart from the publication of a special issue of the George Wright Society Forum in 2005 (Santucci, 2005) and an article in Geoscience Canada in 2008
(Gray, 2008b), there is little evidence that the term has been adopted in North America.

Table 1.2 shows some of the main definitions of geodiversity that have been developed over the past 15 years, including one by the author that has been widely quoted. The table has a commentary on these definitions that suggests that a modified definition would be appropriate to incorporate hydrological features and landscapes in particular. Consequently, I propose the following new definition:

Geodiversity: the natural range (diversity) of geological (rocks, minerals, fossils), geomorphological (landforms, topography, physical processes), soil and hydrological features. It includes their assemblages, structures, systems and contributions to landscapes.

1.4 Aims and structure of the book

It is the thesis of this book that ‘geodiversity’ is a valid and appropriate way in which to look at planet Earth. The specific aims of this book are:

- to raise awareness of the geodiversity of the planet and the value of this diversity;
- to point out the threats to this diversity;
- to examine the ways that this diversity can be conserved, managed and restored;
- to outline the need for a more holistic and integrated approach to nature conservation and land management.

I hope the book will stimulate interest in these topics not just amongst geologists, geomorphologists and soil scientists, many of whom are at least aware of the issues, but also amongst the wider academic and non-academic community—biologists, nature conservationists, landscape architects, planners and politicians—for the world in general has not paid sufficient attention to these issues.

The book is divided into five parts comprising 15 chapters. These follow a natural sequence. The current Chapter 1 begins Part I, which tries to explain what geodiversity is. Chapters 2 and 3 attempt the extremely difficult task of describing the geodiversity of the planet. The aim of these chapters is not to catalogue every variation in rocks, minerals, sediments, processes, landforms, soils, fossils, and so on, but rather to outline the main principles and causes of diversity in the abiotic world. Chapter 2 looks at the early history of the Earth and evolution of global geodiversity. The focus of the book is on the terrestrial systems and the solid Earth (which I shall refer to as the ‘geosphere’), rather than conservation or environmental management of all planetary abiotic systems. Consequently I shall say little about conservation of atmosphere and oceans. Chapter 3 examines the local scale. As stated above, biodiversity is often classified into genetic, species and ecosystem diversity, a classification that is based primarily on scale. Such a system is not as appropriate for geodiversity although we can certainly recognise
scale differences in the abiotic world. For example, landforms combine to form landscapes which combine to make continents or tectonic plates. Nonetheless, the obvious way to classify abiotic nature is by using a well-tried tripartite subdivision of material, form and process. The main diversity in earth materials is in lithospheric materials—rocks, minerals, sediments and soils. Form comprises landforms and physical landscapes while numerous processes act on the materials to produce landforms. Anyone who already has a good understanding of the planet’s geodiversity can probably skip this chapter.

Part II summarises the values of, and threats to, geodiversity. Chapter 4 discusses the value of the planet’s geodiversity in terms of what are called ‘abiotic ecosystem services’ or ‘geosystem services’. A summary diagram at the end of the chapter recognises over 25 types of abiotic value. Chapter 5 outlines the main threats to this valuable geodiversity including mineral extraction, river engineering, fossil collecting, urban expansion, coastal defence, waste disposal, agricultural practices and afforestation. The impact of these activities will be greater on some physical materials and systems than on others, and the issue of sensitivity and vulnerability to human modification emerges from this chapter as very important factors.

The subsequent chapters then follow logically from the previous two using the simple conservation equation:

\[ \text{Value} + \text{Threat} = \text{Conservation need}. \]

Part III comprises four chapters describing the ‘site-based approach’ to geoconservation. Chapter 6 covers the general aspects of international geoconservation, including the important network of Global Stratotype Section and Point (GSSP) sites, while Chapters 7 and 8 describe World Heritage Sites and Global Geoparks respectively. These chapters along with Chapter 9 on National Geoconservation networks and strategies follow traditional methods of conservation, namely by designating protected areas and using legislation and other approaches to conserve and manage them.

Part IV looks at a range of other approaches and new initiatives to extend geoconservation beyond protected areas to the sustainable management of the ‘wider landscape’, Chapter 10 focusing on the landscape conservation, Chapter 11 on land-use planning and Chapter 12 on policy making.

Finally, in Part V I have attempted to bring ideas together. Chapter 13 tries to draw together some of the main elements of the previous seven Chapters to describe some of the aims and methods of geoconservation and the role of geodiversity as an important basis for geoconservation, geotourism, geoparks, etc. Chapter 14 revisits some important issues for geodiversity in relation to biodiversity and discusses a basic paradox for geodiversity. On the one hand the subject needs to establish itself as a distinctive, independent and essential field of nature conservation, but on the other there is a growing need and trend towards an integrated approach to nature conservation incorporating geological and biological systems and indeed to integrated land management in general. Finally Chapter 15 draws some conclusions and tries to establish a revised vision for the year 2025.
This structure of valuing geodiversity, understanding the threats and conserving and managing the resource and indeed the whole impetus for writing the book follows a logical pattern reflected in the following quote from African conservationist, Baba Dioum (in Rodes and Odell, 1997):

For in the end we will conserve only what we love.
We will love only what we understand.
And we will understand only what we are taught.

I hope this book stimulates a much greater interest in the values of geodiversity and the need to conserve them.