

Reader's guide

The fourth *Global Environment Outlook – environment for development (GEO-4)* places sustainable development at the core of the assessment, particularly on issues dealing with intra- and intergenerational equity. The analyses include the need and usefulness of valuation of environmental goods and services, and the role of such services in enhancing development and human well-being, and minimizing human vulnerability to environmental change. The *GEO-4* temporal baseline is 1987, the year in which the World Commission on Environment and Development (WCED) published its seminal report, *Our Common Future*. The Brundtland Commission was established in 1983, under UN General Assembly resolution 38/161 to look at critical environment and development challenges. It was established at a time of an unprecedented rise in pressures on the global environment, and when grave predictions about the human future were becoming commonplace.

The year 2007 is a major milestone in marking what has been achieved in the area of sustainable development and recording efforts – from local to global – to address various environmental challenges. It will be:

- Twenty years since the launch of *Our Common Future*, which defined sustainable development as a blueprint to address our interlinked environment and development challenges.
- Twenty years since the UNEP Governing Council adopted the “Environmental Perspective to the Year 2000 and Beyond”, to implement the major findings of the WCED and set the world on a sustainable development path.
- Fifteen years since the World Summit on Environment and Development (the Rio Earth Summit), adopted Agenda 21, providing the foundation on which to build intra- and intergenerational equity.
- Five years since the World Summit on Sustainable Development (WSSD) in 2002, which adopted the Johannesburg Plan of Implementation.

The year 2007 is also the halfway point to the implementation of some of the internationally recognized development targets, including the Millennium Development Goals (MDGs). These and other issues are analysed in the report.

The *GEO-4* assessment report is the result of a structured and elaborate consultative process, which is outlined at the end of this report. *GEO-4* has 10 chapters, which provide an overview of global social and economic trends, and the state-and-trends of the global and regional environments over the past two decades, as well as the human dimensions of these changes. It highlights the interlinkages as well as the challenges of environmental change and opportunities that the environment provides for human well-being. It provides an outlook for the future, and policy options to address present and emerging environmental issues. The following are the highlights of each chapter:

Chapter 1: Environment for Development – examines the evolution of issues since *Our Common Future* popularized “sustainable development,” highlighting institutional developments and conceptual changes in thought since then, as well as the major environmental, social and economic trends, and their influence on human well-being.

Chapter 2: Atmosphere – highlights how atmospheric issues affect human well-being and the environment. Climate change has become the greatest challenge facing humanity today. Other atmospheric issues, such as air quality and ozone layer depletion are also highlighted.

Chapter 3: Land – addresses the land issues identified by UNEP regional groups, and highlights the pressures of human demands on the land resource as the cause of land degradation. The most dynamic elements of land-use change are the far-reaching changes in forest cover and composition, cropland expansion and intensification, and urban development.

Chapter 4: Water – reviews the pressures that are causing changes in the state of the Earth’s water environment in the context of global and regional drivers. It describes the state-and-trends in changes in the water environment, including its ecosystems and their fish stocks, emphasizing the last 20 years, and the impacts of changes on the environment and human well-being at local to global scales.

Chapter 5: Biodiversity – highlights biodiversity as a key pillar of ecologically sustainable development, providing a synthesis of the latest information on the state-and-trends of global biodiversity. It also links trends in biodiversity to the consequences for sustainable development in a number of key areas.

Chapter 6: Sustaining a Common Future – identifies and analyses priority environmental issues between 1987–2007 for each of the seven GEO regions: Africa, Asia and the Pacific, Europe, Latin America and the Caribbean, North America, West Asia and the Polar Regions. The chapter points out that for the first time since the GEO report series was first published in 1997, all seven regions recognize climate change as a major issue.

Chapter 7: Vulnerability of People and the Environment: Challenges and Opportunities – identifies challenges to and opportunities for improving human well-being through analyses of the vulnerability of some environmental systems and groups in society to environmental and socio-economic changes. The export and import of human vulnerability have grown as a result of the phenomenal global consumption, increased poverty and environmental change.

Chapter 8: Interlinkages: Governance for Sustainability – presents an assessment of the interlinkages within and between the biophysical components of the Earth system, environmental change, the development challenges facing human society, and the governance regimes developed to address such challenges. These elements are interlinked through significant systemic interactions and feedbacks, drivers, policy and technology synergies and trade-offs. Governance approaches that are flexible, collaborative and learning-based may be more responsive and adaptive to change, and therefore, better able to cope with the challenges of linking environment to development.

Chapter 9: The Future Today – builds on previous chapters by presenting four scenarios to the year 2050 – *Markets First*, *Policy First*, *Security First* and *Sustainability First* – which explore how current social, economic and environmental trends may unfold, and what this means for the environment and human well-being. The scenarios examine different policy approaches and societal choices. They are presented using narrative storylines and quantitative data at both global and regional levels. The degree of many environmental changes differs over the next half-century across the scenarios as a result of differences in policy approaches and societal choices.

Chapter 10 From the Periphery to the Core of Decision Making – Options for Action – discusses the main environmental problems highlighted in earlier chapters, and categorizes them along a continuum from *problems with proven solutions* to *problems for which solutions are emerging*. It also describes the adequacy of current policy responses, and possible barriers to more effective policy formulation and implementation. It then outlines the future policy challenges, pointing to the need for a two-track approach: extending policies that have been demonstrated to work for conventional environmental problems into regions lagging behind, and beginning to tackle the emerging environmental problems through structural reforms to social and economic systems.

FOURTH GLOBAL ENVIRONMENT OUTLOOK (GEO-4) ASSESSMENT

GEO-4 conceptual framework

The *GEO-4* assessment uses the drivers-pressures-state-impacts-responses (DPSIR) framework in analysing the interaction between environmental change over the past two decades as well as in presenting the four scenarios in Chapter 9.

The concepts of human well-being and ecosystem services are core in the analysis. However, the report broadens its assessment from focusing exclusively on ecosystems to cover the entire environment and the interaction with society. The framework attempts to reflect the key components of the complex and multidimensional, spatial and temporal chain of cause-and-effect that characterizes the interactions between society and the environment. The *GEO-4* framework

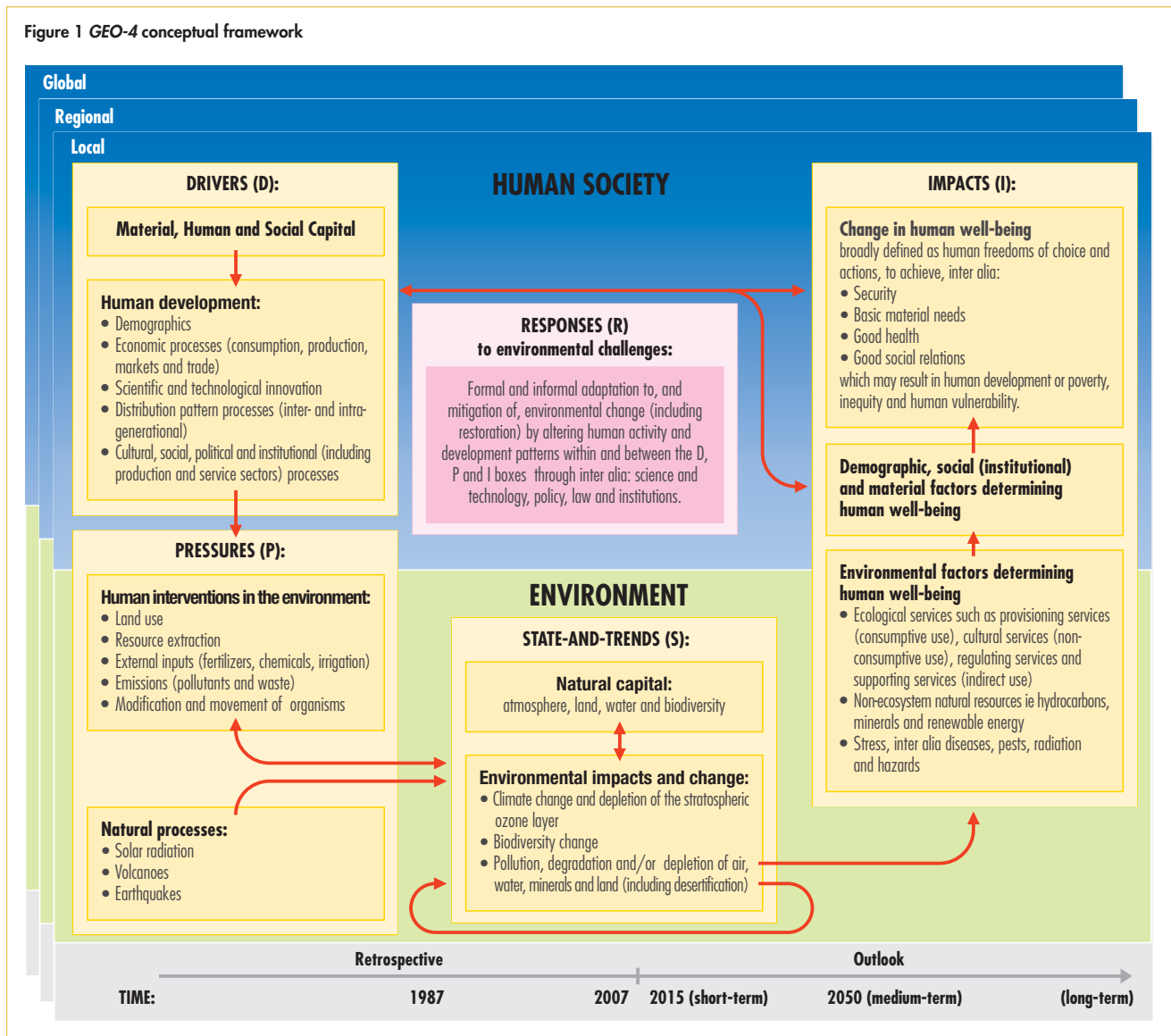
is generic and flexible, and recognizes that a specific thematic and geographic focus may require a specific and customized framework.

The *GEO-4* conceptual framework (Figure 1), therefore, contributes to society's enhanced understanding of the links between the environment and development, human well-being and vulnerability to environmental change. The framework places, together with the environment, the social issues and economic sectors in the 'impacts' category rather than just exclusively in the 'drivers' or 'pressures' categories (Figure 1). The characteristics of the components of the *GEO-4* analytical framework are explained below.

Drivers

Drivers are sometimes referred to as indirect or underlying drivers or driving forces. They refer to fundamental processes in society, which drive activities with a direct impact on the environment. Key drivers include: demographics; consumption and production patterns; scientific and technological innovation; economic demand, markets and trade; distribution patterns; institutional and social-political frameworks and value systems. The characteristics and importance of each driver differ substantially from one region to another, within regions and within and between nations. For example, in the area of population dynamics, most developing countries are still facing population growth while developed countries are faced with a stagnant and

Figure 1 *GEO-4* conceptual framework



ageing population. The resource demand of people influence environmental change.

Pressures

Key pressures include: emissions of substances which may take the form of pollutants or waste; external inputs such as fertilizers, chemicals and irrigation; land use; resource extraction; and modification and movement of organisms. Human interventions may be directed towards causing a desired environmental change such as land use, or they may be intentional or unintentional by-products of other human activities, for example, pollution. The characteristics and importance of each pressure may vary from one region to another, but is often a combination of pressures that lead to environmental change. For example, climate change is a result of emissions of different greenhouse gases, deforestation and land-use practices. Furthermore, the ability to create and transfer environmental pressures onto the environment of other societies varies from one region to another. Affluent societies with high levels of production, consumption and trade tend to contribute more towards global and transboundary environmental pressures than the less affluent societies which interact in more direct fashion with the environment in which they live.

State-and-trends

Environmental state also includes trends, which often refers to environmental change. This change may be natural, human-induced or both. Examples of natural processes include solar radiation, extreme natural events, pollination, and erosion. Key forms of human induced environmental change include climate change, desertification and land degradation, biodiversity loss, and air and water pollution, for example.

Different forms of natural or human-induced changes interact. One form of change, for example, climate change, will inevitably lead to ecosystem change, which may result in desertification and/or biodiversity loss. Different forms of environmental change can reinforce or neutralize each other. For example, a temperature increase due to climate change can, in Europe, partly be offset by changes in ocean currents triggered by climate change. The complexity of the physical, chemical and biological systems constituting the environment makes it hard to predict environmental change, especially when

it is subject to multiple pressures. The state of the environment and its resilience to change varies greatly within and among regions due to different climatic and ecological conditions.

Impacts

The environment is directly or indirectly affected by the social and economic sectors, contributing to change (either negative or positive) in human well-being and in the capacity/ability to cope with environmental changes. Impacts, be they on human well-being, the social and economic sectors or environmental services, are highly dependent on the characteristics of the drivers and, therefore, vary markedly between developing and developed regions.

Responses

Responses address issues of vulnerability of both people and the environment, and provide opportunities for reducing human vulnerability and enhancing human well-being. Responses take place at various levels: for example, environmental laws and institutions at the national level, and multilateral environmental agreements and institutions at the regional and global levels. The capacity to mitigate and/or adapt to environmental change differs among and within regions, and capacity building is, therefore, a major and overarching component of the response components.

The *GEO-4* framework has been used in the analyses of issues in all the 10 chapters, both explicitly and implicitly. Its utility is in integrating the analyses to better reflect the cause-and-effect, and ultimately society's response in addressing the environmental challenges it faces.

A variation of Figure 1 is presented in Chapter 8 as Figure 8.2 to better highlight the dual roles of economic sectors such as agriculture, forestry, fisheries and tourism – in contributing to development and human well-being, and also in exerting pressure on the environment and influencing environmental change, and in some cases, to human vulnerability to such change.





● UNEP Regional Offices
● Collaborating centres

GEO-4 REGIONS

Name	Region	Sub-region
AFRICA		
Cameroon	Africa	Central Africa
Central African Republic	Africa	Central Africa
Chad	Africa	Central Africa
Congo	Africa	Central Africa
Democratic Republic of the Congo	Africa	Central Africa
Equatorial Guinea	Africa	Central Africa
Gabon	Africa	Central Africa
São Tomé and Príncipe	Africa	Central Africa
Burundi	Africa	Eastern Africa
Djibouti	Africa	Eastern Africa
Eritrea	Africa	Eastern Africa
Ethiopia	Africa	Eastern Africa
Kenya	Africa	Eastern Africa
Rwanda	Africa	Eastern Africa
Somalia	Africa	Eastern Africa
Uganda	Africa	Eastern Africa
Algeria	Africa	Northern Africa
Egypt	Africa	Northern Africa
Libyan Arab Jamahiriya	Africa	Northern Africa
Morocco	Africa	Northern Africa
Sudan	Africa	Northern Africa
Tunisia	Africa	Northern Africa
Western Sahara	Africa	Northern Africa
Angola	Africa	Southern Africa
Botswana	Africa	Southern Africa
Lesotho	Africa	Southern Africa
Malawi	Africa	Southern Africa
Mozambique	Africa	Southern Africa
Namibia	Africa	Southern Africa
Saint Helena (United Kingdom)	Africa	Southern Africa
South Africa	Africa	Southern Africa
Swaziland	Africa	Southern Africa
United Republic of Tanzania	Africa	Southern Africa
Zambia	Africa	Southern Africa
Zimbabwe	Africa	Southern Africa
Benin	Africa	Western Africa
Burkina Faso	Africa	Western Africa
Cape Verde	Africa	Western Africa
Cote d'Ivoire	Africa	Western Africa

Name	Region	Sub-region
Gambia	Africa	Western Africa
Ghana	Africa	Western Africa
Guinea	Africa	Western Africa
Guinea-Bissau	Africa	Western Africa
Liberia	Africa	Western Africa
Mali	Africa	Western Africa
Mauritania	Africa	Western Africa
Niger	Africa	Western Africa
Nigeria	Africa	Western Africa
Senegal	Africa	Western Africa
Sierra Leone	Africa	Western Africa
Togo	Africa	Western Africa

Comoros	Africa	Western Indian Ocean
Madagascar	Africa	Western Indian Ocean
Mauritius	Africa	Western Indian Ocean
Mayotte (France)	Africa	Western Indian Ocean
Réunion (France)	Africa	Western Indian Ocean
Seychelles	Africa	Western Indian Ocean

ASIA AND THE PACIFIC

Australia	Asia and the Pacific	Australia and New Zealand
New Zealand	Asia and the Pacific	Australia and New Zealand

Kazakhstan	Asia and the Pacific	Central Asia
Kyrgyzstan	Asia and the Pacific	Central Asia
Tajikistan	Asia and the Pacific	Central Asia
Turkmenistan	Asia and the Pacific	Central Asia
Uzbekistan	Asia and the Pacific	Central Asia

China	Asia and the Pacific	NW Pacific and East Asia
Democratic People's Republic of Korea	Asia and the Pacific	NW Pacific and East Asia
Japan	Asia and the Pacific	NW Pacific and East Asia
Mongolia	Asia and the Pacific	NW Pacific and East Asia
Republic of Korea	Asia and the Pacific	NW Pacific and East Asia

Afghanistan	Asia and the Pacific	South Asia
Bangladesh	Asia and the Pacific	South Asia
Bhutan	Asia and the Pacific	South Asia
India	Asia and the Pacific	South Asia
Iran (Islamic Republic of)	Asia and the Pacific	South Asia
Maldives	Asia and the Pacific	South Asia
Nepal	Asia and the Pacific	South Asia
Pakistan	Asia and the Pacific	South Asia
Sri Lanka	Asia and the Pacific	South Asia

Name	Region	Sub-region
Brunei Darussalam	Asia and the Pacific	South East Asia
Cambodia	Asia and the Pacific	South East Asia
Christmas Island (Australia)	Asia and the Pacific	South East Asia
Indonesia	Asia and the Pacific	South East Asia
Lao People's Democratic Republic	Asia and the Pacific	South East Asia
Malaysia	Asia and the Pacific	South East Asia
Myanmar	Asia and the Pacific	South East Asia
Philippines	Asia and the Pacific	South East Asia
Singapore	Asia and the Pacific	South East Asia
Thailand	Asia and the Pacific	South East Asia
Timor-Leste	Asia and the Pacific	South East Asia
Viet Nam	Asia and the Pacific	South East Asia

American Samoa (United States)	Asia and the Pacific	South Pacific
Cocos (Keeling) Islands (Australia)	Asia and the Pacific	South Pacific
Cook Islands	Asia and the Pacific	South Pacific
Fiji	Asia and the Pacific	South Pacific
French Polynesia (France)	Asia and the Pacific	South Pacific
Guam (United States)	Asia and the Pacific	South Pacific
Johnston Atoll (United States)	Asia and the Pacific	South Pacific
Kiribati	Asia and the Pacific	South Pacific
Marshall Islands	Asia and the Pacific	South Pacific
Micronesia (Federated States of)	Asia and the Pacific	South Pacific
Midway Islands (United States)	Asia and the Pacific	South Pacific
Nauru	Asia and the Pacific	South Pacific
New Caledonia (France)	Asia and the Pacific	South Pacific
Niue	Asia and the Pacific	South Pacific
Norfolk Island (Australia)	Asia and the Pacific	South Pacific
Northern Mariana Islands (United States)	Asia and the Pacific	South Pacific
Palau (Republic of)	Asia and the Pacific	South Pacific
Papua New Guinea	Asia and the Pacific	South Pacific
Pitcairn Island (United Kingdom)	Asia and the Pacific	South Pacific
Samoa	Asia and the Pacific	South Pacific
Solomon Islands	Asia and the Pacific	South Pacific
Tokelau (New Zealand)	Asia and the Pacific	South Pacific
Tonga	Asia and the Pacific	South Pacific
Tuvalu	Asia and the Pacific	South Pacific
Vanuatu	Asia and the Pacific	South Pacific
Wake Island (United States)	Asia and the Pacific	South Pacific
Wallis and Futuna (France)	Asia and the Pacific	South Pacific

Name	Region	Sub-region
EUROPE		
Albania	Europe	Central Europe
Bosnia and Herzegovina	Europe	Central Europe
Bulgaria	Europe	Central Europe
Croatia	Europe	Central Europe
Cyprus	Europe	Central Europe
Czech Republic	Europe	Central Europe
Estonia	Europe	Central Europe
Hungary	Europe	Central Europe
Latvia	Europe	Central Europe
Lithuania	Europe	Central Europe
Montenegro	Europe	Central Europe
Poland	Europe	Central Europe
Romania	Europe	Central Europe
Serbia	Europe	Central Europe
Slovakia	Europe	Central Europe
Slovenia	Europe	Central Europe
The former Yugoslav Republic of Macedonia	Europe	Central Europe
Turkey	Europe	Central Europe

Armenia	Europe	Eastern Europe
Azerbaijan	Europe	Eastern Europe
Belarus	Europe	Eastern Europe
Georgia	Europe	Eastern Europe
Moldova, Republic of	Europe	Eastern Europe
Russian Federation	Europe	Eastern Europe
Ukraine	Europe	Eastern Europe

Andorra	Europe	Western Europe
Austria	Europe	Western Europe
Belgium	Europe	Western Europe
Denmark	Europe	Western Europe
Faroe Islands (Denmark)	Europe	Western Europe
Finland	Europe	Western Europe
France	Europe	Western Europe
Germany	Europe	Western Europe
Gibraltar (United Kingdom)	Europe	Western Europe
Greece	Europe	Western Europe
Guernsey (United Kingdom)	Europe	Western Europe
Holy See	Europe	Western Europe
Iceland	Europe	Western Europe
Ireland	Europe	Western Europe
Isle of Man (United Kingdom)	Europe	Western Europe
Israel	Europe	Western Europe
Italy	Europe	Western Europe
Jersey (United Kingdom)	Europe	Western Europe

Name	Region	Sub-region
Liechtenstein	Europe	Western Europe
Luxembourg	Europe	Western Europe
Malta	Europe	Western Europe
Monaco	Europe	Western Europe
Netherlands	Europe	Western Europe
Norway	Europe	Western Europe
Portugal	Europe	Western Europe
San Marino	Europe	Western Europe
Spain	Europe	Western Europe
Svalbard and Jan Mayen Islands (Norway)	Europe	Western Europe
Sweden	Europe	Western Europe
Switzerland	Europe	Western Europe
United Kingdom of Great Britain and Northern Ireland	Europe	Western Europe

LATIN AMERICA AND THE CARIBBEAN		
Anguilla (United Kingdom)	Latin America and the Caribbean	Caribbean
Antigua and Barbuda	Latin America and the Caribbean	Caribbean
Aruba (Netherlands)	Latin America and the Caribbean	Caribbean
Bahamas	Latin America and the Caribbean	Caribbean
Barbados	Latin America and the Caribbean	Caribbean
British Virgin Islands (United Kingdom)	Latin America and the Caribbean	Caribbean
Cayman Islands (United Kingdom)	Latin America and the Caribbean	Caribbean
Cuba	Latin America and the Caribbean	Caribbean
Dominica	Latin America and the Caribbean	Caribbean
Dominican Republic	Latin America and the Caribbean	Caribbean
Grenada	Latin America and the Caribbean	Caribbean
Guadeloupe (France)	Latin America and the Caribbean	Caribbean
Haiti	Latin America and the Caribbean	Caribbean
Jamaica	Latin America and the Caribbean	Caribbean
Martinique (France)	Latin America and the Caribbean	Caribbean
Montserrat (United Kingdom)	Latin America and the Caribbean	Caribbean
Netherlands Antilles (Netherlands)	Latin America and the Caribbean	Caribbean
Puerto Rico (United States)	Latin America and the Caribbean	Caribbean
Saint Kitts and Nevis	Latin America and the Caribbean	Caribbean
Saint Lucia	Latin America and the Caribbean	Caribbean
Saint Vincent and the Grenadines	Latin America and the Caribbean	Caribbean
Trinidad and Tobago	Latin America and the Caribbean	Caribbean
Turks and Caicos Islands (United Kingdom)	Latin America and the Caribbean	Caribbean
United States Virgin Islands (United States)	Latin America and the Caribbean	Caribbean
Belize	Latin America and the Caribbean	Meso-America
Costa Rica	Latin America and the Caribbean	Meso-America
El Salvador	Latin America and the Caribbean	Meso-America
Guatemala	Latin America and the Caribbean	Meso-America
Honduras	Latin America and the Caribbean	Meso-America

Name	Region	Sub-region
Mexico	Latin America and the Caribbean	Meso-America
Nicaragua	Latin America and the Caribbean	Meso-America
Panama	Latin America and the Caribbean	Meso-America

Argentina	Latin America and the Caribbean	South America
Bolivia	Latin America and the Caribbean	South America
Brazil	Latin America and the Caribbean	South America
Chile	Latin America and the Caribbean	South America
Colombia	Latin America and the Caribbean	South America
Ecuador	Latin America and the Caribbean	South America
French Guiana (France)	Latin America and the Caribbean	South America
Guyana	Latin America and the Caribbean	South America
Paraguay	Latin America and the Caribbean	South America
Peru	Latin America and the Caribbean	South America
Suriname	Latin America and the Caribbean	South America
Uruguay	Latin America and the Caribbean	South America
Venezuela	Latin America and the Caribbean	South America

NORTH AMERICA

Canada	North America	North America
United States of America	North America	North America

POLAR

Antarctic	Polar	Antarctic
Arctic (The eight Arctic countries are: Alaska (United States), Canada, Finland, Greenland (Denmark), Iceland, Norway, Russia, Sweden)	Polar	Arctic

WEST ASIA

Bahrain	West Asia	Arabian Peninsula
Kuwait	West Asia	Arabian Peninsula
Oman	West Asia	Arabian Peninsula
Qatar	West Asia	Arabian Peninsula
Saudi Arabia	West Asia	Arabian Peninsula
United Arab Emirates	West Asia	Arabian Peninsula
Yemen	West Asia	Arabian Peninsula

Iraq	West Asia	Mashriq
Jordan	West Asia	Mashriq
Lebanon	West Asia	Mashriq
Occupied Palestinian Territory	West Asia	Mashriq
Syrian Arab Republic	West Asia	Mashriq

