

Topic 6.4.2: Environmental education

3.292. Environmental education refers to the process of sharing and constructing environmental information and knowledge, as well as information on how humans interact with the environment. Environmental education is carried out through a variety of programmes, including formal and informal education and training, directed towards different audiences. It may be curriculum- and classroom-based or experiential, and may be provided on-site or in community settings by government agencies or NGOs. Environmental education is integral to education for sustainable development.

3.293. This topic may include but is not limited to the characterization of environmental education programmes, the specific actions associated with them and their results, in terms of the number of people participating in such programmes.

3.294. Statistics on environmental education may include the allocation of resources for education, the number and description of education programmes in schools and the number of students pursuing environment-related higher education.

3.295. The main institutional partners include the ministry of education, ministry of environment or equivalent institution, and the NSO. They also include other institutions, such as universities and non-profit institutions that develop and deliver environmental education curricula. The information to be produced for this topic comes primarily from administrative records and is usually qualitative in nature, but may also include monetary data on resources spent. It is usually compiled at the national and subnational levels.

Table 3.6.4.2
Statistics and related information for Topic 6.4.2

Component 6: Environmental Protection, Management and Engagement			
Subcomponent 6.4: Environmental Information and Awareness			
Topic 6.4.2: Environmental education			
Statistics and related information (Bold text —Core Set/Tier 1; regular text—Tier 2; <i>italicized text</i> —Tier 3)	Category of measurement	Potential aggregations and scales	Methodological guidance
a. Environmental education		• National	
1. <i>Allocation of resources by central and local authorities for environmental education</i>	Currency	• Subnational	
2. <i>Number and description of environmental education programmes in schools</i>	Description, number		
3. <i>Number of students pursuing environment-related higher education (e.g., science, management, education, engineering)</i>	Number		

Topic 6.4.3: Environmental perception and awareness

3.296. Environmental perception refers to individuals' and groups' notions of, attitudes towards and evaluations of the environment, both as a whole or with respect to specific environmental issues. Individuals and communities make decisions and judgments, and take actions based on subjective perceptions of environmental information and experiences. Values and attitudes thus "filter" information and transform it into perception in a culturally specific manner. Environmental awareness involves the gradual understanding of environmental issues, and the recognition of the connections among human actions, development, sustainability and human responsibility in these processes. Environmental awareness involves the realization that humans and ecosystems co-exist in a shared environment, which is ultimately the biosphere. Awareness fosters pro-environmental attitudes and predispositions for action and changed behaviour.

3.297. This topic includes the perceptions and awareness of the environment on the part of the general public or a specific group through the measurement of knowledge, attitudes, values

and actions. It also encompasses perceptions of governments' environmental policies to address pressing environmental concerns. Countries and international polling firms have increased their public opinion polling to measure such information across society.

3.298. Knowledge about environmental issues influences attitudes, which determine the extent to which people are predisposed to participate in pro-environmental activities. Attitudes are also formed based on the individual's or community's underlying values, thus developing general awareness about environmental concerns.

3.299. The main institutional partners include the environmental authority and the NSO, along with other institutions that may conduct surveys of environmental perceptions (e.g., local governments or polling firms). These statistics are produced through surveys designed for data collection on this topic. Statistics that fall under this topic are primarily qualitative and are compiled at both the subnational and national levels.

Table 3.6.4.3
Statistics and related information for Topic 6.4.3

Component 6: Environmental Protection, Management and Engagement			
Subcomponent 6.4: Environmental Information and Awareness			
Topic 6.4.3: Environmental perception and awareness			
Statistics and related information			
(Bold text —Core Set/Tier 1; regular text—Tier 2; <i>italicized text</i> —Tier 3)	Category of measurement	Potential aggregations and scales	Methodological guidance
a. Public environmental perception and awareness		• National	
1. <i>Knowledge and attitudes about environmental issues or concerns</i>	Description	• Subnational	
2. <i>Knowledge and attitudes about environmental policies</i>	Description		

Topic 6.4.4: Environmental engagement

3.300. Environmental engagement involves the transformation of perceptions and attitudes into concrete, pro-environmental actions. Individual and social participation and engagement in environmental processes intended to improve and protect the local and global environment are a concrete manifestation of understanding and motivation of, and commitment to protecting and improving the environment, expressed through behaviour.

3.301. This topic is intended to capture any available statistics on a country's pro-environmental activities and programmes. Pro-environmental activities are those undertaken by civil society or community groups to protect, improve and manage the environment. This topic also includes information about environmental programmes (e.g., conservation, energy efficiency, tree planting) and outreach programmes (e.g., efforts to increase public awareness of key environmental issues).

3.302. Statistics may include the number and capacity of pro-environmental NGOs, such as the number of institutions and amount of financial and human resources. This information is usually available. They may also include the number of pro-environmental activities and pro-environmental programmes.

3.303. Data about environmental participation and actions are based on administrative records or are obtained from surveys, and are usually produced at the subnational level. The main institutional partners include the ministry of environment or equivalent institution, municipalities and local governments and NGOs.

Table 3.6.4.4
Statistics and related information for Topic 6.4.4

Component 6: Environmental Protection, Management and Engagement			
Subcomponent 6.4: Environmental Information and Awareness			
Topic 6.4.4: Environmental engagement			
Statistics and related information			
(Bold text —Core Set/Tier 1; regular text—Tier 2; <i>italicized text</i> —Tier 3)	Category of measurement	Potential aggregations and scales	Methodological guidance
a. Environmental engagement		<ul style="list-style-type: none"> • National • Subnational 	
1. Existence of pro-environmental NGOs (number of NGOs and their respective human and financial resources)	Currency, number		
2. <i>Number of pro-environmental activities</i>	Number		
3. <i>Number of pro-environmental programmes</i>	Number		

Chapter 4

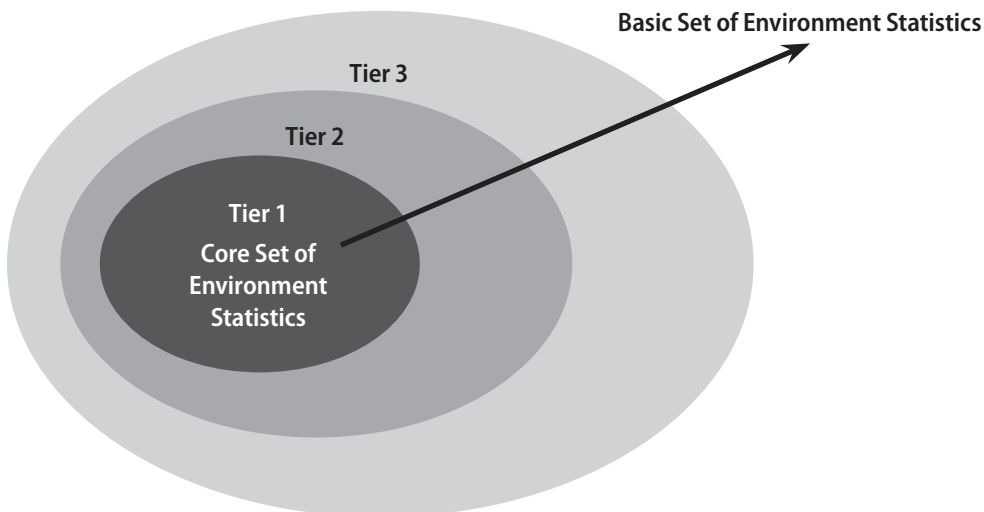
From the Basic Set to the Core Set of Environment Statistics

4.1. This chapter further develops the FDES by presenting the statistics that describe the statistical topics grouped within the Basic Set of Environment Statistics and the Core Set of Environment Statistics. These Sets have been developed in response to country demand, based on their relevance to environmental issues and corresponding FDES topics. The statistics contained in these Sets are useful for generating national sets or databases of environment statistics, reporting on environment or sustainable development, calculating environmental indicators and generating environmental-economic accounts.

4.1. The Basic Set of Environment Statistics

4.2. As seen in Chapter 3, the Basic Set of Environment Statistics is a comprehensive, but not exhaustive, set of statistics designed to support countries developing environment statistics programmes according to their national priorities for statistical development. This Basic Set of Statistics is flexible enough to be adapted to individual countries' environmental concerns, priorities and resources. The Basic Set of Environment Statistics thus features a progression of three tiers (see Figure 4.1). Tier 1 defines the Core Set of Environment Statistics, that is, a set of statistics which countries are recommended to consider producing in the short-term. As national priorities require and data availability and resources permit, the scope may be widened gradually to include the statistics in Tiers 2 and 3. A description of Tiers 2 and 3 follows in the text below.

Figure 4.1
The Core Set embedded in the Basic Set of Environment Statistics



4.3. This approach is useful in providing an overview of the entire field of environment statistics. It can help statisticians identify data providing institutions and make the arrangements for regular data acquisition. It serves as a starting point for identifying appropriate statistical series and will help to determine relevant classifications.

4.4. The development of the Basic Set of Environment Statistics began in 2010 with a review of the UNSD List of Environmental Indicators, adopted by the United Nations Statistical Commission in 1995, and the lists of environment statistics contained in the two technical reports which accompanied the 1984 FDES.^{86,87} The process also involved assessing international data collection efforts, including major global or regional indicator initiatives. The selection of statistics also took into account the relevant data needed to respond to global environmental conventions and MEAs.

4.5. The process included a review of 2,575 environmental indicators and statistics. Indicators and statistics were reviewed from 37 sources and 65 lists/sets from international, regional and inter-governmental institutions, global environmental conventions, academia and NGOs. These indicators and statistics were then organized around preliminary themes and subthemes. By indicating global, regional and thematic priorities, this approach helped to determine the FDES component structure. It also provided the opportunity to identify those closely related fields that, due to their importance, should be included in the scope of the FDES. The necessary underlying statistics were listed separately for each environmental indicator. Additionally, statistics considered as important in their own right—that is, not necessarily as an input to any indicator—were also included.

4.6. Based on this aforementioned analysis, statistics that focus on the most important environmental and associated economic and social activities, which can be used for analysis and reporting on the environment, were included in the Basic Set of Environment Statistics. This set does not constitute an exhaustive collection of environment statistics, but it does present a selection of 458 statistics that are considered relevant, appropriate, adequate and important for describing and measuring the environment and for responding to policy needs or public information requirements. All environment statistics identified for inclusion in the Basic Set were then grouped according to the FDES structure outlined in Chapter 3, which consists of components, subcomponents and topics.

4.7. The contents of the Basic Set were then tested, on a pilot basis, in 25 countries from all regions of the world at various stages of developing their national environment statistics. The pilot test in each country consisted primarily of assessing the relevance and availability of the statistics. The countries were also asked to indicate the priority of each statistic for national policymaking. The results of this pilot test have helped to prioritize and determine the appropriate set of statistics to be included in the Core Set (Tier 1), Tier 2 and Tier 3.

4.8. The Basic Set was then divided into three tiers of statistics with the Core Set of Environment Statistics (Tier 1) identified. The three tiers of statistics are defined as follows:

- Tier 1 corresponds to the Core Set of Environment Statistics, which are of high priority and relevance to most countries and have a sound methodological foundation. It is recommended that countries consider producing them in the short-term.
- Tier 2 includes environment statistics which are of priority and relevance to most countries but require greater investment of time, resources or methodological development. It is recommended that countries consider producing them in the medium-term.
- Tier 3 includes environment statistics which are either of lower priority or require significant methodological development. It is recommended that countries consider producing them in the long-term.

⁸⁶ United Nations Statistics Division (1988). *Concepts and Methods of Environment Statistics: Human Settlements Statistics—A Technical Report*, available from http://unstats.un.org/unsd/publication/SeriesF/SeriesF_51e.pdf (accessed 4 August 2017).

⁸⁷ United Nations Statistics Division (1991). *Concepts and Methods of Environment Statistics: Statistics of the Natural Environment—A Technical Report*, available from http://unstats.un.org/unsd/publication/SeriesF/SeriesF_57E.pdf (accessed 4 August 2017).

The table below provides the number of statistics according to each of the three Tiers and the six components.

Table 4.1
Distribution of Statistics by Tier and Component

	Component 1	Component 2	Component 3	Component 4	Component 5	Component 6	Total
Tier 1	32	30	19	4	12	3	100
Tier 2	58	51	34	11	22	24	200
Tier 3	51	43	5	16	20	23	158
Total	141	124	58	31	54	50	458

4.9. The main selection criteria for the Core Set of Environment Statistics (Tier 1) were relevance, measurability and methodological soundness, described further as follows:

- i. Relevance: Core statistics should meet the needs of the broad variety of users and be responsive to changes in the environment and related human activities;
- ii. Measurability: Core statistics should have sufficient supporting data and metadata readily available, be of accepted quality and be updated regularly, or it should be possible to compile them in the near term;
- iii. Methodological soundness: Core statistics should adhere to professional and scientific methods, as well as to internationally agreed concepts and definitions to the extent possible.

4.10. Finally, the Basic Set and Core Set were analysed based on their usefulness in monitoring and measuring the SDGs emerging from the discussions around the post-2015 development agenda.

4.2. The Core Set of Environment Statistics

4.11. The Core Set of Environment Statistics consists of a limited number of statistics, as well as some non-statistical information on the environment. The Core Set represents a broad consensus of opinion on the pertinence and feasibility of these statistics. As such, it is intended to foster collection, coordination and harmonization of environment statistics at the national, regional and global levels.

4.12. When a country faces stringent resource constraints in developing a national environment statistics programme, or is at the early stages in the development of environment statistics, the Core Set is well suited to provide guidance in determining priorities, scope, timing and periodicity in the production of such statistics, depending on national circumstances. It presents a comprehensive body of relevant environment statistics which can easily be tailored to suit specific national needs.

4.13. The Core Set can also help to identify data gaps in established national environment statistics programmes. Some countries may have initiated environment statistics programmes in response to very specific event-driven imperatives. The use of the Core Set and the “Manual on the Basic Set of Environment Statistics” for its compilation will allow countries to build on such beginnings by adding or adjusting statistics based on an organized set of concepts and definitions that have been agreed upon and used widely. These can complement existing environmental data collection activities to provide countries with a more complete statistical description of environmental concerns.

4.14. The Core Set provides guidance on the statistics to be included in a national environment statistics programme to provide national policymakers and international agencies with the most relevant information on environmental issues of interest to countries and those that extend beyond national boundaries. It incorporates the most pertinent statistics needed to report on global environmental conventions and MEAs. As such, its use in national statistical programmes will help improve reporting on these conventions and agreements.

4.15. The Core Set will be accompanied by detailed guidance on agreed concepts, definitions, classifications and data compilation methods that will be included in the “Manual on the Basic Set of Environment Statistics”. This methodological guidance will be used to train and assist countries that wish to incorporate the Core Set into their national statistical programmes. This will be invaluable in ensuring the availability of a defined set of relevant and internationally comparable environment statistics.

4.16. In conclusion, the Core Set, together with the Basic Set of Environment Statistics, can contribute to the gradual production and strengthening of environment statistics within countries and thus enable and support the development, monitoring and assessment of evidence-based environmental policies. They can be instrumental when dealing with the growing demand for monitoring and reporting on the environment and sustainable development. The FDES, as well as the Core and Basic Sets of Environment Statistics, provides a flexible framework that can identify and organize the environment statistics necessary to inform users on a range of environmental issues. While the Core Set and the Basic Set are not exhaustive, given the state of current knowledge, they are comprehensive enough to respond to both existing and emerging issues.

4.3. Contents of the Core Set of Environment Statistics

4.17. Table 4.2 presents the Core Set which organizes the statistics by the components, sub-components and statistical topics of the FDES. The Basic Set of Environment Statistics, showing where the Core Set is embedded for each statistical topic of the FDES, is found in Annex A. The numbering and lettering in this table are not necessarily consecutive because the statistics, which are all Tier 1, are only a selection of the Basic Set.

Legend

1. The first level in the tables, preceded by a lower-case letter, is the statistics group/category; in some cases where there are no statistics below the first level, this level may also describe a specific statistic.
2. The second level in the tables, preceded by a number, identifies specific statistics.
3. Bold text in the fourth and fifth columns denotes Tier 1 (Core Set) statistics.
4. Categories of measurement are shown in the sixth column.

The Core Set of Environment Statistics

Table 4.2
The Core Set of Environment Statistics

Component	Subcomponent	Topic	Core Set / Tier 1 Statistics	Category of measurement			
Component 1: Environmental Conditions and Quality	Subcomponent 1.1: Physical Conditions	Topic 1.1.1: Atmosphere, climate and weather	a. Temperature	1. Monthly average 2. Minimum monthly average 3. Maximum monthly average	Degrees Degrees Degrees		
			b. Precipitation (also in 2.6.1.a)	1. Annual average 2. Long-term annual average	Height Height		
			d. Watersheds	1. Description of main watersheds	Area, description		
		Topic 1.1.2: Hydrographical characteristics	Subcomponent 1.1: Physical Conditions	Topic 1.1.1: Atmosphere, climate and weather	a. Geographical and geographical information	2. Area of country or region	Area, location
					b. Coastal waters (including area of coral reefs and mangroves)		Area, description
					c. Length of marine coastline		Length
					d. Coastal area		Area
		Topic 1.1.4: Soil characteristics	Subcomponent 1.1: Physical Conditions	Topic 1.1.1: Atmosphere, climate and weather	a. Soil characterization	1. Area by soil types	Area
					b. Soil degradation	1. Area affected by soil erosion 2. Area affected by desertification	Area Area
		Subcomponent 1.2: Land Cover, Ecosystems and Biodiversity	Subcomponent 1.2: Land Cover, Ecosystems and Biodiversity	Topic 1.2.1: Land cover	a. Area under land cover categories		Area
Topic 1.2.2: Ecosystems and biodiversity	a. General ecosystem characteristics, extent and pattern				1. Area of ecosystems	Area	
	c. Biodiversity				1. Known flora and fauna species	Number	
	d. Protected areas and species				1. Protected terrestrial and marine area (also in 1.2.3.a)	Area	
Topic 1.2.3: Forests	Subcomponent 1.2: Land Cover, Ecosystems and Biodiversity			Topic 1.2.1: Land cover	a. Forest area	1. Total	Area
					a. Local air quality	1. Concentration level of particulate matter (PM ₁₀) 2. Concentration level of particulate matter (PM _{2.5}) 3. Concentration level of tropospheric ozone (O ₃) 4. Concentration level of carbon monoxide (CO) 5. Concentration level of sulphur dioxide (SO ₂) 6. Concentration levels of nitrogen oxides (NO _x)	Concentration Concentration Concentration Concentration Concentration Concentration
Topic 1.3.1: Air quality	Subcomponent 1.3: Environmental Quality			Topic 1.2.2: Ecosystems and biodiversity	a. Nutrients and chlorophyll	1. Concentration level of nitrogen 2. Concentration level of phosphorous	Concentration Concentration
					b. Organic matter	1. Biochemical oxygen demand (BOD)	Concentration
					c. Pathogens	1. Concentration levels of faecal coliforms	Concentration
Topic 1.3.2: Freshwater quality	Subcomponent 1.3: Environmental Quality			Topic 1.2.2: Ecosystems and biodiversity	a. Nutrients and chlorophyll	1. Concentration level of nitrogen 2. Concentration level of phosphorous	Concentration Concentration
		b. Organic matter	1. Biochemical oxygen demand (BOD)		Concentration		
		c. Pathogens	1. Concentration levels of faecal coliforms		Concentration		
Topic 1.3.3: Marine water quality	Subcomponent 1.3: Environmental Quality	Topic 1.2.2: Ecosystems and biodiversity	a. Nutrients and chlorophyll	1. Concentration level of nitrogen 2. Concentration level of phosphorous	Concentration Concentration		
			b. Organic matter	1. Biochemical oxygen demand (BOD)	Concentration		
			c. Coral bleaching	1. Area affected by coral bleaching	Area		

Table 4.2
The Core Set of Environment Statistics (continued)

Component	Subcomponent	Topic	Core Set/Tier 1 Statistics	Category of measurement	
Component 2: Environmental Resources and their Use	Subcomponent 2.1: Mineral Resources	Topic 2.1.1: Stocks and changes of mineral resources	1. Stocks of commercially recoverable resources	Mass, volume	
			5. Extraction	Mass, volume	
	Subcomponent 2.2: Energy Resources	Topic 2.2.1: Stocks and changes of energy resources	1. Stocks of commercially recoverable resources	Mass, volume	
			5. Extraction	Mass, volume	
			1. Total production	Energy unit, mass, volume	
	Subcomponent 2.3: Land	Topic 2.2.2: Production, trade and consumption of energy	2. Production from non-renewable sources	Energy unit, mass, volume	
			3. Production from renewable sources	Energy unit, mass, volume	
			4. Primary energy production	Energy unit, mass, volume	
			7. Secondary energy production	Energy unit, mass, volume	
			b. Total energy supply	Energy unit, mass, volume	
c. Final consumption of energy			Energy unit, mass, volume		
a. Area under land use categories			Area		
Subcomponent 2.5: Biological Resources	Topic 2.3.1: Land use	Topic 2.3.2: Use of forest land	1. Area deforested	Area	
			1. Stocks of timber resources	Volume	
	Topic 2.5.1: Timber resources	Topic 2.5.2: Aquatic resources	a. Fish capture production	Mass	
			b. Aquaculture production	Mass	
	Topic 2.5.3: Crops	Topic 2.5.4: Livestock	1. Area planted	Area	
			2. Area harvested	Area	
			3. Amount produced	Mass	
	Subcomponent 2.6: Water Resources	Topic 2.6.1: Water resources	Topic 2.6.2: Abstraction, use and returns of water	1. Natural fertilizers (e.g., manure, compost, lime) (also in 3.4.1.a)	Area, mass, volume
				2. Chemical fertilizers (also in 3.4.1.a)	Area, mass, volume
				3. Pesticides (also in 3.4.1.b)	Area, mass, volume
Topic 2.6.1: Water resources			Topic 2.6.1: Water resources	1. Number of live animals	Number
				1. Precipitation (also in 1.1.1.b)	Volume
				2. Inflow from neighbouring territories	Volume
Topic 2.6.2: Abstraction, use and returns of water	Topic 2.6.2: Abstraction, use and returns of water	1. Evapotranspiration	Volume		
		a. Total water abstraction	Volume		
		b. Water abstraction from surface water	Volume		
Topic 2.6.2: Abstraction, use and returns of water	Topic 2.6.2: Abstraction, use and returns of water	1. From renewable groundwater resources	Volume		
		2. From non-renewable groundwater resources	Volume		

Component	Subcomponent	Topic	Core Set / Tier 1 Statistics	Category of measurement
Component 3: Residuals	Subcomponent 3.1: Emissions to Air	Topic 3.1.1: Emissions of greenhouse gases	a. Total emissions of direct greenhouse gases (GHGs), by gas:	1. Carbon dioxide (CO ₂) Mass
				2. Methane (CH ₄) Mass
				3. Nitrous oxide (N ₂ O) Mass
		Topic 3.1.2: Emissions of indirect greenhouse gases (GHGs), by gas:	1. Sulphur dioxide (SO ₂) Mass	
			2. Nitrogen oxides (NO _x) Mass	
	Subcomponent 3.2: Generation and Management of Wastewater	Topic 3.2.1: Generation and pollutant content of wastewater	a. Volume of wastewater generated	Volume
		Topic 3.2.2: Collection and treatment of wastewater	a. Volume of wastewater collected	Volume
			b. Volume of wastewater treated	Volume
		Topic 3.2.3: Discharge of wastewater to the environment	a. Wastewater discharge	1. Total volume of wastewater discharged to the environment after treatment Volume
				2. Total volume of wastewater discharged to the environment without treatment Volume
Subcomponent 3.3: Generation and Management of Waste	Topic 3.3.1: Generation of waste	a. Amount of waste generated by source	Mass	
		c. Amount of hazardous waste generated	Mass	
		Topic 3.3.2: Management of waste	a. Municipal waste	1. Total municipal waste collected Mass
				2. Amount of municipal waste treated by type of treatment and disposal Mass
			3. Number of municipal waste treatment and disposal facilities Number	
		Topic 3.3.3: Management of waste	b. Hazardous waste	1. Total hazardous waste collected Mass
			2. Amount of hazardous waste treated by type of treatment and disposal Mass	
	3. Number of hazardous waste treatment and disposal facilities Number			
		d. Amount of recycled waste	Mass	

Table 4.2
The Core Set of Environment Statistics (continued)

Component	Subcomponent	Topic	Core Set / Tier 1 Statistics	Category of measurement
Component 4: Extreme Events and Disasters	Subcomponent 4.1: Natural Extreme Events and Disasters	Topic 4.1.1: Occurrence of natural extreme events and disasters	a. Occurrence of natural extreme events and disasters	1. Type of natural extreme event and disaster (geophysical, meteorological, hydrological, climatological, biological)
		Topic 4.1.2: Impact of natural extreme events and disasters	a. People affected by natural extreme events and disasters	2. Location
Component 5: Human Settlements and Environmental Health	Subcomponent 5.1: Human Settlements	Topic 5.1.2: Access to selected basic services	b. Economic losses due to natural extreme events and disasters (e.g., damage to buildings, transportation networks, loss of revenue for businesses, utility disruption)	Currency
			a. Population using an improved drinking water source	Number
			b. Population using an improved sanitation facility	Number
			c. Population served by municipal waste collection	Number
			e. Population connected to wastewater treatment	Number
			f. Population supplied by water supply industry	Number
		Topic 5.1.5: Environmental concerns specific to urban settlements	c. Number of private and public vehicles	Number
	Subcomponent 5.2: Environmental Health	Topic 5.2.2: Water-related diseases and conditions	a. Water-related diseases and conditions	1. Incidence
				2. Prevalence
				3. Mortality
		Topic 5.2.3: Vector-borne diseases	a. Vector-borne diseases	1. Incidence
				2. Prevalence
				3. Mortality
Component 6: Environmental Protection, Management and Engagement	Subcomponent 6.1: Environmental Protection and Resource Management Expenditure	Topic 6.1.1: Government environmental protection and resource management expenditure	a. Government environmental protection and resource management expenditure	Currency
				1. Annual government environmental protection expenditure
	Subcomponent 6.2: Environmental Governance and Regulation	Topic 6.2.2: Environmental regulation and instruments	a. Direct regulation	1. List of regulated pollutants and description (e.g., by year of adoption and maximum allowable levels)
				1. List and description (e.g., country's year of participation ^a) of MEAs and other global environmental conventions

^a Participation means that the country or area has become party to the agreements under the treaty or convention, which is achieved through various means, depending on the country's circumstances, namely: accession, acceptance, approval, formal confirmation, ratification and succession. Countries or areas that have signed but not become party to the agreements under a given convention or treaty are not considered to be participating.

Chapter 5

Applications of the FDES to cross-cutting environmental issues

5.1. The FDES is a framework which organizes the domain of environment statistics into six components, which are broken down further into subcomponents and statistical topics. The statistical topics in the FDES, and the underlying environment statistics in the Basic Set of Environment Statistics and the Core Set of Environment Statistics, may be combined and reorganized in different ways based on specific analytical needs and policy requirements. This is an inherent aspect of the design of the FDES as a flexible multipurpose framework.

5.2. This chapter describes how to identify and organize the FDES topics and statistics from the Basic Set of Environment Statistics and the Core Set of Environment Statistics necessary to inform on four selected cross-cutting issues: water, energy, climate change and agriculture. The cross-cutting issues of water and energy apply the contents of the FDES to environmental resource use and management. Climate change uses the FDES to inform on a highly relevant scientific and policy issue. Agriculture and the environment focuses on the application of the FDES to a specific economic activity. This chapter discusses these environmental issues and provides a detailed list of the relevant corresponding individual environment statistics for each issue. Statistics related to these cross-cutting issues are certainly relevant from the regional and global perspectives, but the emphasis is on the national level.

5.3. When compiling environment statistics on a particular cross-cutting issue, it is important to begin by understanding the scientific background, underlying processes and cause-effect relationships. It is also necessary to analyse and understand the relevance of the issue to the country and particular subnational areas, economic activities and social groups, national policy implications and commitments, institutional aspects and the international context. This comprehensive view will help the environmental statistician better adapt the FDES, the Core Set of Environment Statistics and the Basic Set of Environment Statistics to provide environment statistics that meet users' needs.

5.4. The cross-cutting issues of water, energy, climate change and agriculture discussed in this chapter are examples and should be considered illustrative applications of the FDES to selected cross-cutting issues. FDES users may wish to develop other analyses of cross-cutting issues for specific purposes based on national relevance and needs (e.g., sustainable management of natural resources, environmental impacts of specific activities such as tourism, transport, mining and manufacturing, or issues such as the relationship between poverty and the environment).

5.5. The statistics for describing the selected cross-cutting issues are organized based on the relevant policy framework or the sequence of events that can be used to inform about the related processes. These sequences reflect the occurrence of events, based on the nature of the issue. In each case, the correspondence of these sequences with the FDES structure is described. Each application is presented both at the level of the statistical topics and of individual statistics from the Core Set of Environment Statistics and the Basic Set of Environment Statistics.

5.6. The presentation at the topic level includes the names of the topics relevant to the cross-cutting issue. The presentation at the level of individual statistics shows which statistics under the relevant topics are necessary for the statistical description of the cross-cutting issue.

5.1. Water and the environment

5.7. Water is fundamental to every form of life and plays a critical role in human development in terms of both quantity and quality. Increasing scarcity of and competition for water resources and potable water impede development, compromise ecosystem functions, undercut human health and contribute to conflicts between and within states.

5.8. The quality of and access to potable water remains a critical public health issue, particularly in developing countries, although the situation has been improving over recent decades. Human consumption and agricultural practices also place increasing pressures on water supply. Efforts to restructure natural hydrological systems have provided benefits to the human subsystem but have also created new environmental issues. These issues are wide-ranging and include water-borne diseases, stress on ecosystems, loss of natural and human habitats, reduction of fish and aquatic plant productivity, waterlogging and salinization of soils, and conflicts between upstream and downstream water users. In addition, deforestation has also contributed to higher levels of siltation, more devastating and frequent floods, as well as to the degradation of ecosystems and productivity of inland and coastal waters. The need to monitor the sustainable management of water resources and the demand for related environment statistics are increasing worldwide.

5.9. Water use and returns affect the environment in many ways. If water is abstracted faster than it is replenished naturally, the resource can be depleted and even exhausted. Water abstraction itself affects the environment by decreasing, even if momentarily, the water available for other purposes, including key ecological functions. Distribution losses can cause inefficiency and require larger amounts of water to be extracted. When water is used and returned to the environment, quality and pollution become the major problems. Returns of water can either be treated or not, and to different extents, so when it is returned it has the potential to adversely affect the environment. Water temperature is also an important factor in returns to the environment for key ecological functions. Distribution and access to adequate drinking water and water for other uses such as small scale agriculture, particularly in rural areas of developing countries, raise another problem. Similar access problems also occur with regard to sanitation facilities in developing countries.

5.10. Protecting the quality of fresh water is important for ecosystems, drinking water supply, food production and recreational water use. The main causes of water quality degradation include elevated levels of salinity; suspended matter; nutrients, which can be positive for food production of aquatic resources in certain circumstances; toxins and odour compounds; pesticides and other contaminants; water temperature; dissolved oxygen and pH outside natural ranges; and radiological hazards.

5.11. In addition to quantity and quality of water supply, the distribution of this supply within countries is of key importance. When assessing distribution of total available water, spatial and temporal considerations must be considered. Subnational statistics must be used, as aggregated national statistics can be misleading, and subnational statistics must be assessed in the context of the specific geographic location, as the challenges of equitable water distribution vary depending on location (e.g., rainforest versus desert). Seasonality must also be considered as precipitation levels change over time and seasonal flooding occurs in certain areas.

5.12. International partners in water assessment and management include UN-Water, the UN inter-agency mechanism on all fresh water-related issues, including sanitation. The UN has also issued water quantity, quality and sanitation MDGs, specifically target 7.a, indica-

tor 7.5 (proportion of total water resources used) and target 7.c, indicators 7.8 (proportion of population using an improved drinking water source) and 7.9 (proportion of population using an improved sanitation facility). FAO has developed a number of initiatives related to water statistics, notably the AQUASTAT database, which serves as a global information system on water and agriculture.⁸⁸ It collects, analyses and disseminates data and information by country and region. Several international and inter-governmental organisations collect data on water statistics from countries (such as through the UNSD/UNEP Questionnaire on Environment Statistics and the OECD/Eurostat Questionnaire on the State of the Environment). In addition, the UN has developed the IRWS in an effort to assist countries to establish and strengthen information systems for water as part of their integrated water resources management (IWRM).⁸⁹ IWRM is a process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems.⁹⁰ The IRWS was adopted by the United Nations Statistical Commission in 2010. With regard to environmental-economic accounts for water, the SEEA-Water is also available.⁹¹ Part I of the SEEA-Water was adopted as an interim international statistical standard by the United Nations Statistical Commission in 2007.

5.13. The Rio+20 United Nations Conference on Sustainable Development (20-22 June 2012) provided the context for the pivotal role of water. Its outcome document noted that water was “at the core of sustainable development”,⁹² because of its link to key global challenges such as poverty eradication, the empowerment of women and the protection of human health. It underscored the need to address environmental challenges such as floods, droughts and water scarcity and, ultimately, the balance between water supply and demand. It encouraged investment in water infrastructure and sanitation services and stressed the need to significantly improve water quality, wastewater treatment and water efficiency, while reducing water losses.

Application of the FDES to water statistics

5.14. In the figures below, the FDES has been applied specifically to organize the relevant environment statistics needed to inform on issues related to water resources. Two approaches have been followed.

5.15. The first approach illustrates how the structure of the FDES and its six components describe the relationship of water with the environment, the society and the economy in a holistic manner, as shown in Figures 5.1 and 5.2.

Figure 5.1
Water and the environment in the FDES—topic level

Component 1: Environmental Conditions and Quality			
Subcomponent 1.1: Physical Conditions		Subcomponent 1.2: Land Cover, Ecosystems and Biodiversity	Subcomponent 1.3: Environmental Quality
1.1.1	Atmosphere, climate and weather	1.2.1	Land cover
1.1.2	Hydrographical characteristics	1.2.2	Ecosystems and biodiversity
1.1.3	Geological and geographical information		
1.3.2			Freshwater quality
			1.3.3 Marine water quality
Component 2: Environmental Resources and their Use			
Subcomponent 2.3: Land		Subcomponent 2.5: Biological Resources	Subcomponent 2.6: Water Resources
2.3.1	Land use	2.5.2	Aquatic resources
			2.6.1 Water resources
			2.6.2 Abstraction, use and returns of water
Component 3: Residuals			
Subcomponent 3.2: Generation and Management of Wastewater			
3.2.1	Generation and pollutant content of wastewater		
3.2.2	Collection and treatment of wastewater		
3.2.3	Discharge of wastewater to the environment		

⁸⁸ Food and Agriculture Organization of the United Nations (2014). Aquastat, available from www.fao.org/nr/water/aquastat/main/index.stm (accessed 4 August 2017).

⁸⁹ United Nations Statistics Division (2012). *International Recommendations for Water Statistics*. Available from <http://unstats.un.org/unsd/envaccounting/irws/irwswebversion.pdf> (accessed 4 August 2017).

⁹⁰ Global Water Partnership (2012). “What is IWRM?”, available from www.gwp.org/en/The-Challenge/What-is-IWRM/ (accessed 4 August 2017).

⁹¹ United Nations Statistics Division (2012). *System of Environmental-Economic Accounts for Water (SEEA-Water)*, available from <http://unstats.un.org/unsd/envaccounting/seeaw/seeawaterwebversion.pdf> (accessed 4 August 2017).

⁹² United Nations (2012). Rio+20 outcome document, “The Future We Want”, paragraph 119, available from <https://sustainabledevelopment.un.org/futurewewant.html> (accessed 4 August 2017).

Component 4: Extreme Events and Disasters			
Subcomponent 4.1: Natural Extreme Events and Disasters		Subcomponent 4.2: Technological Disasters	
4.1.1	Occurrence of natural extreme events and disasters	4.2.1	Occurrence of technological disasters
4.1.2	Impact of natural extreme events and disasters	4.2.2	Impact of technological disasters

Component 5: Human Settlements and Environmental Health			
Subcomponent 5.1: Human Settlements		Subcomponent 5.2: Environmental Health	
5.1.2	Access to selected basic services	5.2.2	Water-related diseases and conditions
5.1.3	Housing conditions		

Component 6: Environmental Protection, Management and Engagement			
Subcomponent 6.1: Environmental Protection and Resource Management Expenditure		Subcomponent 6.2: Environmental Governance and Regulation	Subcomponent 6.3: Extreme Event Preparedness and Disaster Management
6.1.1	Government environmental protection and resource management expenditure	6.2.1	Institutional strength
		6.2.2	Environmental regulation and instruments
6.1.2	Corporate, non-profit institution and household environmental protection and resource management expenditure	6.2.3	Participation in MEAs and environmental conventions
		6.3.1	Preparedness for natural extreme events and disasters
		6.3.2	Preparedness for technological disasters

Figure 5.2
Water and the environment in the Core Set and Basic Set of Environment Statistics—environment statistics level

(**Bold text**—Core Set/Tier 1; regular text—Tier 2; *italicized text*—Tier 3)

Component 1: Environmental Conditions and Quality	
Subcomponent 1.1: Physical Conditions	
Topic 1.1.1: Atmosphere, climate and weather	1.1.1.b: Precipitation (also in 2.6.1) 1.1.1.b.1: Annual average 1.1.1.b.2: Long-term annual average 1.1.1.b.3: Monthly average 1.1.1.b.4: Minimum monthly value 1.1.1.b.5: Maximum monthly value 1.1.1.c: Relative humidity 1.1.1.c.1: Minimum monthly value 1.1.1.c.2: Maximum monthly value 1.1.1.h: Occurrence of El Niño/La Niña events, when relevant <i>1.1.1.h.1: Occurrence</i> <i>1.1.1.h.2: Time period</i>
Topic 1.1.2: Hydrographical characteristics	1.1.2.a: Lakes 1.1.2.a.1: Surface area <i>1.1.2.a.2: Maximum depth</i> 1.1.2.b: Rivers and streams 1.1.2.b.1: Length 1.1.2.c: Artificial reservoirs <i>1.1.2.c.1: Surface area</i> <i>1.1.2.c.2: Maximum depth</i> 1.1.2.d: Watersheds 1.1.2.d.1: Description of main watersheds 1.1.2.e: Seas 1.1.2.e.1: Coastal waters 1.1.2.e.2: Territorial sea 1.1.2.e.3: Exclusive Economic Zone (EEZ) <i>1.1.2.e.4: Sea level</i> <i>1.1.2.e.5: Area of sea ice</i> <i>1.1.2.f: Aquifers</i> 1.1.2.g: Glaciers
Topic 1.1.3: Geological and geographical information	1.1.3.b: Coastal waters (including area of coral reefs and mangroves) 1.1.3.c: Length of marine coastline

Subcomponent 1.2: Land Cover, Ecosystems and Biodiversity	
Topic 1.2.1: Land cover	1.2.1.a: Area under land cover categories
Topic 1.2.2: Ecosystems and biodiversity	1.2.2.a: General ecosystem characteristics, extent and pattern 1.2.2.a.1: Area of ecosystems 1.2.2.a.2: <i>Proximity of ecosystem to urban areas and cropland</i> 1.2.2.b: Ecosystems' chemical and physical characteristics 1.2.2.b.1: <i>Nutrients</i> 1.2.2.b.2: <i>Carbon</i> 1.2.2.b.3: <i>Pollutants</i> 1.2.2.c: Biodiversity 1.2.2.c.1: Known flora and fauna species 1.2.2.c.2: Endemic flora and fauna species 1.2.2.c.3: Invasive alien flora and fauna species 1.2.2.c.4: Species population 1.2.2.c.5: <i>Habitat fragmentation</i> 1.2.2.d: Protected areas and species 1.2.2.d.1: Protected terrestrial and marine area (also in 1.2.3.a) 1.2.2.d.2: Protected flora and fauna species
Subcomponent 1.3: Environmental Quality	
Topic 1.3.2: Freshwater quality	1.3.2.a: Nutrients and chlorophyll 1.3.2.a.1: Concentration level of nitrogen 1.3.2.a.2: Concentration level of phosphorous 1.3.2.a.3: Concentration level of chlorophyll A 1.3.2.b: Organic matter 1.3.2.b.1: Biochemical oxygen demand (BOD) 1.3.2.b.2: Chemical oxygen demand (COD) 1.3.2.c: Pathogens 1.3.2.c.1: Concentration levels of faecal coliforms 1.3.2.d: Metals (e.g., mercury, lead, nickel, arsenic, cadmium) 1.3.2.d.1: Concentration levels in sediment and freshwater 1.3.2.d.2: Concentration levels in freshwater organisms 1.3.2.e: Organic contaminants (e.g., PCBs, DDT, pesticides, furans, dioxins, phenols, radioactive waste) 1.3.2.e.1: Concentration levels in sediment and freshwater 1.3.2.e.2: Concentration levels in freshwater organisms 1.3.2.f: Physical and chemical characteristics 1.3.2.f.1: pH/acidity/alkalinity 1.3.2.f.2: Temperature 1.3.2.f.3: <i>Total suspended solids (TSS)</i> 1.3.2.f.4: Salinity 1.3.2.f.5: Dissolved oxygen (DO) 1.3.2.g: Plastic waste and other freshwater debris 1.3.2.g.1: Amount of plastic waste and other debris

Topic 1.3.3: Marine water quality	<ul style="list-style-type: none"> 1.3.3.a: Nutrients and chlorophyll <ul style="list-style-type: none"> 1.3.3.a.1: Concentration level of nitrogen 1.3.3.a.2: Concentration level of phosphorous 1.3.3.a.3: Concentration level of chlorophyll A 1.3.3.b: Organic matter <ul style="list-style-type: none"> 1.3.3.b.1: Biochemical oxygen demand (BOD) 1.3.3.b.2: Chemical oxygen demand (COD) 1.3.3.c: Pathogens <ul style="list-style-type: none"> 1.3.3.c.1: Concentration levels of faecal coliforms in recreational marine waters 1.3.3.d: Metals (e.g., mercury, lead, nickel, arsenic, cadmium) <ul style="list-style-type: none"> 1.3.3.d.1: Concentration levels in sediment and marine water 1.3.3.d.2: Concentration levels in marine organisms 1.3.3.e: Organic contaminants (e.g., PCBs, DDT, pesticides, furans, dioxins, phenols and radioactive waste) <ul style="list-style-type: none"> <i>1.3.3.e.1: Concentration levels in sediment and marine water</i> <i>1.3.3.e.2: Concentration levels in marine organisms</i> 1.3.3.f: Physical and chemical characteristics <ul style="list-style-type: none"> <i>1.3.3.f.1: pH/acidity/alkalinity</i> 1.3.3.f.2: Temperature <i>1.3.3.f.3: Total suspended solids (TSS)</i> <i>1.3.3.f.4: Salinity</i> 1.3.3.f.5: Dissolved oxygen (DO) <i>1.3.3.f.6: Density</i> 1.3.3.g: Coral bleaching <ul style="list-style-type: none"> 1.3.3.g.1: Area affected by coral bleaching 1.3.3.h: Plastic waste and other marine debris <ul style="list-style-type: none"> <i>1.3.3.h.1: Amount of plastic waste and other debris in marine waters</i> 1.3.3.i: Red tide <ul style="list-style-type: none"> <i>1.3.3.i.1: Occurrence</i> <i>1.3.3.i.2: Impacted area</i> <i>1.3.3.i.3: Duration</i> 1.3.3.j: Oil pollution <ul style="list-style-type: none"> <i>1.3.3.j.1: Area of oil slicks</i> <i>1.3.3.j.2: Amount of tar balls</i>
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Component 2: Environmental Resources and their Use

Subcomponent 2.3: Land

Topic 2.3.1: Land use **2.3.1.a: Area under land use categories**

Subcomponent 2.5: Biological Resources

Topic 2.5.2: Aquatic resources	<ul style="list-style-type: none"> 2.5.2.a: Fish capture production 2.5.2.b: Aquaculture production 2.5.2.e: Amount used of: <ul style="list-style-type: none"> <i>2.5.2.e.1: Pellets (also in 3.4.1.c)</i> <i>2.5.2.e.2: Hormones (also in 3.4.1.d)</i> <i>2.5.2.e.3: Colourants (also in 3.4.1.e)</i> <i>2.5.2.e.4: Antibiotics (also in 3.4.1.f)</i> <i>2.5.2.e.5: Fungicides</i> 2.5.2.f: Aquatic resources <ul style="list-style-type: none"> 2.5.2.f.1: Stocks of aquatic resources <i>2.5.2.f.2: Additions to aquatic resources</i> <i>2.5.2.f.3: Reductions in aquatic resources</i>
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Subcomponent 2.6: Water Resources	
Topic 2.6.1: Water resources	<p>2.6.1.a: Inflow of water to inland water resources</p> <p>2.6.1.a.1: Precipitation (also in 1.1.1.b)</p> <p>2.6.1.a.2: Inflow from neighbouring territories</p> <p><i>2.6.1.a.3: Inflow subject to treaties</i></p> <p>2.6.1.b: Outflow of water from inland water resources</p> <p>2.6.1.b.1: Evapotranspiration</p> <p>2.6.1.b.2: Outflow to neighbouring territories</p> <p>2.6.1.b.3: Outflow subject to treaties</p> <p>2.6.1.b.4: Outflow to the sea</p> <p>2.6.1.c: Inland water stocks</p> <p>2.6.1.c.1: Surface water stocks in artificial reservoirs</p> <p>2.6.1.c.2: Surface water stocks in lakes</p> <p><i>2.6.1.c.3: Surface water stocks in rivers and streams</i></p> <p><i>2.6.1.c.4: Surface water stocks in wetlands</i></p> <p><i>2.6.1.c.5: Surface water stocks in snow, ice and glaciers</i></p> <p>2.6.1.c.6: Groundwater stocks</p>
Topic 2.6.2: Abstraction, use and returns of water	<p>2.6.2.a: Total water abstraction</p> <p>2.6.2.b: Water abstraction from surface water</p> <p>2.6.2.c: Water abstraction from groundwater</p> <p>2.6.2.c.1: From renewable groundwater resources</p> <p>2.6.2.c.2: From non-renewable groundwater resources</p> <p>2.6.2.d: Water abstracted for own use</p> <p>2.6.2.e: Water abstracted for distribution</p> <p>2.6.2.f: Desalinated water</p> <p>2.6.2.g: Reused water</p> <p>2.6.2.h: Water use</p> <p><i>2.6.2.i: Rainwater collection</i></p> <p><i>2.6.2.j: Water abstraction from the sea</i></p> <p>2.6.2.k: Losses during transport</p> <p><i>2.6.2.l: Exports of water</i></p> <p><i>2.6.2.m: Imports of water</i></p> <p><i>2.6.2.n: Returns of water</i></p>
Component 3: Residuals	
Subcomponent 3.2: Generation and Management of Wastewater+	
Topic 3.2.1: Generation and pollutant content of wastewater	<p>3.2.1.a: Volume of wastewater generated</p> <p>3.2.1.b: Pollutant content of wastewater</p>
Topic 3.2.2: Collection and treatment of wastewater	<p>3.2.2.a: Volume of wastewater collected</p> <p>3.2.2.b: Volume of wastewater treated</p> <p>3.2.2.c: Total urban wastewater treatment capacity</p> <p>3.2.2.c.1: Number of plants</p> <p>3.2.2.c.2: Capacity of plants</p> <p>3.2.2.d: Total industrial wastewater treatment capacity</p> <p>3.2.2.d.1: Number of plants</p> <p>3.2.2.d.2: Capacity of plants</p>
Topic 3.2.3: Discharge of wastewater to the environment	<p>3.2.3.a: Wastewater discharge</p> <p>3.2.3.a.1: Total volume of wastewater discharged to the environment after treatment</p> <p>3.2.3.a.2: Total volume of wastewater discharged to the environment without treatment</p> <p>3.2.3.b: Pollutant content of discharged wastewater</p>

Component 4: Extreme Events and Disasters	
Subcomponent 4.1: Natural Extreme Events and Disasters	
Topic 4.1.1: Occurrence of natural extreme events and disasters	4.1.1.a: Occurrence of natural extreme events and disasters [droughts and floods]: 4.1.1.a.1: Type of natural extreme event and disaster (geophysical, meteorological, hydrological, climatological, biological) 4.1.1.a.2: Location 4.1.1.a.3: Magnitude (where applicable) 4.1.1.a.4: Date of occurrence 4.1.1.a.5: Duration
Topic 4.1.2: Impact of natural extreme events and disasters	4.1.2.a: People affected by natural extreme events and disasters [droughts and floods] 4.1.2.a.1: Number of people killed 4.1.2.a.2: Number of people injured 4.1.2.a.3: Number of people homeless 4.1.2.a.4: Number of people affected 4.1.2.b: Economic losses due to natural extreme events and disasters [droughts and floods] 4.1.2.c: Physical losses/damages due to natural extreme events and disasters [droughts and floods] 4.1.2.d: Effects of natural extreme events and disasters on integrity of ecosystems [droughts and floods] 4.1.2.d.1: <i>Area affected by natural disasters</i> 4.1.2.d.2: <i>Loss of vegetation cover</i> 4.1.2.d.3: <i>Area of watershed affected</i> 4.1.2.d.4: <i>Other</i> 4.1.2.e: <i>External assistance received</i> [droughts and floods]
Subcomponent 4.2: Technological Disasters	
Topic 4.2.1: Occurrence of technological disasters	4.2.1.a: Occurrence of technological disasters [affecting only marine and inland water bodies] 4.2.1.a.1: Type of technological disaster 4.2.1.a.2: <i>Location</i> 4.2.1.a.3: <i>Date of occurrence</i> 4.2.1.a.4: <i>Duration</i>
Topic 4.2.2: Impact of technological disasters	4.2.2.a: People affected by technological disasters [affecting only marine and inland water bodies] 4.2.2.a.1: Number of people killed 4.2.2.a.2: <i>Number of people injured</i> 4.2.2.a.3: <i>Number of people homeless</i> 4.2.2.a.4: <i>Number of people affected</i> 4.2.2.b: Economic losses due to technological disasters [affecting only marine and inland water bodies] 4.2.2.c: Physical losses/damages due to technological disasters [affecting only marine and inland water bodies] 4.2.2.d: Effects of technological disasters on integrity of ecosystems [affecting only marine and inland water bodies] 4.2.2.d.1: <i>Area affected by technological disasters</i> 4.2.2.d.2: <i>Loss of vegetation cover</i> 4.2.2.d.3: <i>Area of watershed affected</i> 4.2.2.d.4: <i>Other</i> (e.g., for oil spills: volume of oil released into the environment, impact on ecosystem) 4.2.2.e: <i>External assistance received</i>
Component 5: Human Settlements and Environmental Health	
Subcomponent 5.1: Human Settlements	
Topic 5.1.2: Access to selected basic services	5.1.2.a: Population using an improved drinking water source 5.1.2.b: Population using an improved sanitation facility 5.1.2.d: <i>Population connected to wastewater collection system</i> 5.1.2.e: Population connected to wastewater treatment 5.1.2.f: Population supplied by water supply industry
Topic 5.1.3: Housing conditions	5.1.3.c: Population living in hazard-prone areas 5.1.3.d: Hazard-prone areas
Subcomponent 5.2: Environmental Health	
Topic 5.2.2: Water-related diseases and conditions	5.2.2.a: Water-related diseases and conditions 5.2.2.a.1: Incidence 5.2.2.a.2: Prevalence 5.2.2.a.3: Mortality 5.2.2.a.4: <i>Loss of work days</i> 5.2.2.a.5: <i>Estimates of economic cost in monetary terms</i>

Component 6: Environmental Protection, Management and Engagement	
Subcomponent 6.1: Environmental Protection and Resource Management Expenditure	
Topic 6.1.1: Government environmental protection and resource management expenditure	6.1.1.a: Government environmental protection and resource management expenditure 6.1.1.a.1: Annual government environmental protection expenditure [on water] 6.1.1.a.2: Annual government resource management expenditure [on water]
Topic 6.1.2: Corporate, non-profit institution and household environmental protection and resource management expenditure	6.1.2.a: Private sector environmental protection and resource management expenditure [on water] 6.1.2.a.1: Annual corporate environmental protection expenditure 6.1.2.a.2: <i>Annual corporate resource management expenditure</i> 6.1.2.a.3: <i>Annual non-profit institution environmental protection expenditure</i> 6.1.2.a.4: <i>Annual non-profit institution resource management expenditure</i> 6.1.2.a.5: <i>Annual household environmental protection expenditure</i> 6.1.2.a.6: <i>Annual household resource management expenditure</i>
Subcomponent 6.2: Environmental Governance and Regulation	
Topic 6.2.1: Institutional strength	6.2.1.a: Government environmental institutions and their resources 6.2.1.a.1: Name of main environmental [water] authority and year of establishment 6.2.1.a.2: Annual budget of the main environmental [water] authority 6.2.1.a.3: Number of staff of the main environmental [water] authority 6.2.1.a.4: List of environmental [water] departments in other authorities and year of establishment 6.2.1.a.5: Annual budget of environmental [water] departments in other authorities 6.2.1.a.6: Number of staff of environmental [water] departments in other authorities
Topic 6.2.2: Environmental regulation and instruments	6.2.2.a: Direct regulation 6.2.2.a.1: List of regulated [water] pollutants and description (e.g., by year of adoption and maximum allowable levels) 6.2.2.a.2: Description (e.g., name, year established) of licensing system to ensure compliance with environmental [water] standards for businesses or other new facilities 6.2.2.a.3: Number of applications for licenses [compliance with water standards] received and approved per year 6.2.2.a.4: List of quotas for biological [aquatic] resource extraction 6.2.2.a.5: Budget and number of staff dedicated to enforcement of environmental [water] regulations 6.2.2.b: Economic instruments 6.2.2.b.1: <i>List and description</i> (e.g., year of establishment) of <i>green/environmental</i> [related to water] <i>taxes</i> 6.2.2.b.2: <i>List and description</i> (e.g., year of establishment) of <i>environmentally relevant subsidies</i> [related to water] 6.2.2.b.3: <i>List of [water] eco-labelling and environmental certification programmes</i>
Topic 6.2.3: Participation in MEAs and environmental conventions	6.2.3.a: Participation in MEAs and other global environmental conventions 6.2.3.a.1: List and description (e.g., country's year of participation ^a) of MEAs and other global environmental conventions [regulating, managing and affecting water]
Subcomponent 6.3: Extreme Event Preparedness and Disaster Management	
Topic 6.3.1: Preparedness for natural extreme events and disasters	6.3.1.a: National natural extreme events and disaster preparedness and management systems [related to droughts and floods] 6.3.1.a.1: Existence of national disaster plans/programmes 6.3.1.a.2: Description of national disaster plans/programmes 6.3.1.a.7: <i>Existence of early warning systems for all major hazards</i> 6.3.1.a.8: <i>Expenditure on disaster prevention, preparedness, clean-up and rehabilitation</i>
Topic 6.3.2: Preparedness for technological disasters	6.3.2.a: National technological disaster preparedness and management systems [related to water] 6.3.2.a.1: <i>Existence and description</i> (e.g., number of staff) of <i>public disaster management plans/programmes</i> (and private when available) 6.3.2.a.2: <i>Expenditure on disaster prevention, preparedness, clean-up and rehabilitation</i>

^a Participation means that the country or area has become party to the agreements under the treaty or convention, which is achieved through various means, depending on the country's circumstances, namely: accession, acceptance, approval, formal confirmation, ratification and succession. Countries or areas that have signed but not become party to the agreements under a given convention or treaty are not considered to be participating.

5.16. The second approach shows how the statistical topics of the FDES can be reorganized with a narrower focus on the management of water supply and wastewater treatment, following the sequence of abstraction, distribution and use of water, returns of water and emissions to the environment, and protection and mitigation activities, as shown in Figures 5.3 and 5.4.

Figure 5.3
Topics in the FDES that relate to water, according to the sequence of water use and management

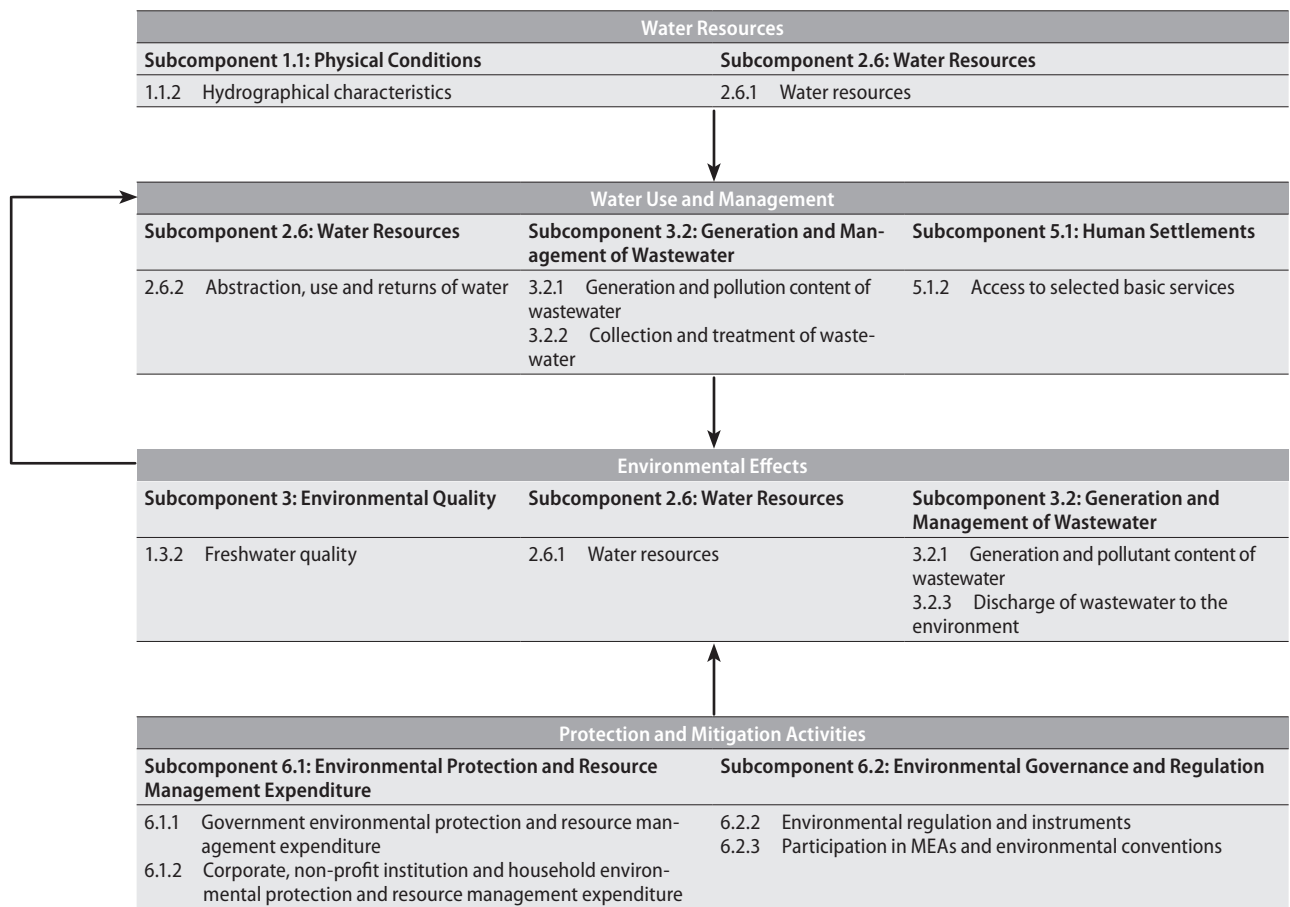


Figure 5.4
Water statistics in the Core Set and Basic Set of Environment Statistics, according to the sequence of water use and management

(**Bold text**—Core Set/Tier 1; regular text—Tier 2; *italicized text*—Tier 3)

Water Resources	
Subcomponent 1.1: Physical Conditions	
Topic 1.1.2: Hydrographical characteristics	1.1.2.a: Lakes 1.1.2.a.1: Surface area 1.1.2.a.2: <i>Maximum depth</i> 1.1.2.b: Rivers and streams 1.1.2.b.1: Length 1.1.2.c: Artificial reservoirs 1.1.2.c.1: <i>Surface area</i> 1.1.2.c.2: <i>Maximum depth</i> 1.1.2.d: Watersheds 1.1.2.d.1: Description of main watersheds 1.1.2.f: <i>Aquifers</i> 1.1.2.g: <i>Glaciers</i>
Subcomponent 2.6: Water Resources	
Topic 2.6.1: Water resources	2.6.1.a: Inflow of water to inland water resources 2.6.1.a.1: Precipitation (also in 1.1.1.b) 2.6.1.a.2: Inflow from neighbouring territories 2.6.1.a.3: <i>Inflow subject to treaties</i> 2.6.1.b: Outflow of water from inland water resources 2.6.1.b.1: Evapotranspiration 2.6.1.b.2: Outflow to neighbouring territories 2.6.1.b.3: Outflow subject to treaties 2.6.1.b.4: Outflow to the sea 2.6.1.c: Inland water stocks 2.6.1.c.1: Surface water stocks in artificial reservoirs 2.6.1.c.2: Surface water stocks in lakes 2.6.1.c.3: <i>Surface water stocks in rivers and streams</i> 2.6.1.c.4: <i>Surface water stocks in wetlands</i> 2.6.1.c.5: <i>Surface water stocks in snow, ice and glaciers</i> 2.6.1.c.6: Groundwater stocks
Water Use and Management	
Subcomponent 2.6: Water Resources	
Topic 2.6.2: Abstraction, use and returns of water	2.6.2.a: Total water abstraction 2.6.2.b: Water abstraction from surface water 2.6.2.c: Water abstraction from groundwater 2.6.2.c.1: From renewable groundwater resources 2.6.2.c.2: From non-renewable groundwater resources 2.6.2.d: Water abstracted for own use 2.6.2.e: Water abstracted for distribution 2.6.2.f: Desalinated water 2.6.2.g: Reused water 2.6.2.h: Water use 2.6.2.i: <i>Rainwater collection</i> 2.6.2.j: <i>Water abstraction from the sea</i> 2.6.2.k: Losses during transport 2.6.2.l: <i>Exports of water</i> 2.6.2.m: <i>Imports of water</i> 2.6.2.n: <i>Returns of water</i>

Subcomponent 3.2: Generation and Management of Wastewater	
Topic 3.2.1: Generation and pollutant content of wastewater	3.2.1.a: Volume of wastewater generated
Topic 3.2.2: Collection and treatment of wastewater	3.2.2.a: Volume of wastewater collected 3.2.2.b: Volume of wastewater treated 3.2.2.c: Total urban wastewater treatment capacity 3.2.2.c.1: Number of plants 3.2.2.c.2: Capacity of plants 3.2.2.d: Total industrial wastewater treatment capacity 3.2.2.d.1: Number of plants 3.2.2.d.2: Capacity of plants
Subcomponent 5.1: Human Settlements	
Topic 5.1.2: Access to selected basic services	5.1.2.a: Population using an improved drinking water source 5.1.2.b: Population using an improved sanitation facility 5.1.2.e: Population connected to wastewater treatment 5.1.2.f: Population supplied by water supply industry
Environmental Effects	
Subcomponent 1.3: Environmental Quality	
Topic 1.3.2: Freshwater quality	1.3.2.a: Nutrients and chlorophyll 1.3.2.a.1: Concentration level of nitrogen 1.3.2.a.2: Concentration level of phosphorous 1.3.2.a.3: Concentration level of chlorophyll A 1.3.2.b: Organic matter 1.3.2.b.1: Biochemical oxygen demand (BOD) 1.3.2.b.2: Chemical oxygen demand (COD) 1.3.2.c: Pathogens 1.3.2.c.1: Concentration levels of faecal coliforms 1.3.2.d: Metals (e.g., mercury, lead, nickel, arsenic, cadmium) 1.3.2.d.1: Concentration levels in sediment and freshwater 1.3.2.d.2: Concentration levels in freshwater organisms 1.3.2.e: Organic contaminants (e.g., PCBs, DDT, pesticides, furans, dioxins, phenols and radioactive waste) 1.3.2.e.1: Concentration levels in sediment and freshwater 1.3.2.e.2: Concentration levels in freshwater organisms 1.3.2.f: Physical and chemical characteristics 1.3.2.f.1: pH/acidity/alkalinity 1.3.2.f.2: Temperature 1.3.2.f.3: Total suspended solids (TSS) 1.3.2.f.4: Salinity 1.3.2.f.5: Dissolved oxygen (DO) 1.3.2.g: Plastic waste and other freshwater debris 1.3.2.g.1: Amount of plastic waste and other debris
Subcomponent 2.6: Water Resources	
Topic 2.6.1: Water resources	2.6.1.c: Inland water stocks 2.6.1.c.1: Surface water stocks in artificial reservoirs 2.6.1.c.2: Surface water stocks in lakes 2.6.1.c.3: Surface water stocks in rivers and streams 2.6.1.c.4: Surface water stocks in wetlands 2.6.1.c.5: Surface water stocks in snow, ice and glaciers 2.6.1.c.6: Groundwater stocks
Subcomponent 3.2: Generation and Management of Wastewater	
Topic 3.2.1: Generation and pollutant content of wastewater	3.2.1.b: Pollutant content of wastewater
Topic 3.2.3: Discharge of wastewater to the environment	3.2.3.a: Wastewater discharge 3.2.3.a.1: Total volume of wastewater discharged to the environment after treatment 3.2.3.a.2: Total volume of wastewater discharged to the environment without treatment 3.2.3.b: Pollutant content of discharged wastewater

Protection and Mitigation Activities	
Subcomponent 6.1: Environmental Protection and Resource Management Expenditure	
Topic 6.1.1: Government environmental protection and resource management expenditure	6.1.1.a: Government environmental protection and resource management expenditure [on water] 6.1.1.a.1: Annual government environmental protection expenditure 6.1.1.a.2: Annual government resource management expenditure
Topic 6.1.2: Corporate, non-profit institution and household environmental protection and resource management expenditure	6.1.2.a: Private sector environmental protection and resource management expenditure [on water] 6.1.2.a.1: Annual corporate environmental protection expenditure 6.1.2.a.2: <i>Annual corporate resource management expenditure</i> 6.1.2.a.3: <i>Annual non-profit institution environmental protection expenditure</i> 6.1.2.a.4: <i>Annual non-profit institution resource management expenditure</i> 6.1.2.a.5: <i>Annual household environmental protection expenditure</i> 6.1.2.a.6: <i>Annual household resource management expenditure</i>
Subcomponent 6.2: Environmental Governance and Regulation	
Topic 6.2.2: Environmental regulation and instruments	6.2.2.a: Direct regulation 6.2.2.a.1: List of regulated pollutants and description (e.g., by year of adoption and maximum allowable levels) [related to water] 6.2.2.a.2: Description (e.g., name, year established) of licensing system to ensure compliance with environmental standards for businesses or other new facilities [related to water] 6.2.2.a.3: Number of applications for licenses [compliance with water standards] received and approved per year 6.2.2.a.4: List of quotas for biological [aquatic] resource extraction 6.2.2.a.5: Budget and number of staff dedicated to enforcement of environmental regulations [related to water] 6.2.2.b: Economic instruments 6.2.2.b.1: <i>List and description</i> (e.g., year of establishment) of <i>green/environmental</i> [related to water] <i>taxes</i> 6.2.2.b.2: <i>List and description</i> (e.g., year of establishment) of <i>environmentally relevant subsidies</i> [related to water] 6.2.2.b.3: <i>List of [water] eco-labelling and environmental certification programmes</i>
Topic 6.2.3: Participation in MEAs and environmental conventions	6.2.3.a: Participation in MEAs and other global environmental conventions 6.2.3.a.1: List and description (e.g., country's year of participation ^a) of MEAs and other global environmental conventions [regulating, managing and affecting water]

^a Participation means that the country or area has become party to the agreements under the treaty or convention, which is achieved through various means, depending on the country's circumstances, namely: accession, acceptance, approval, formal confirmation, ratification and succession. Countries or areas that have signed but not become party to the agreements under a given convention or treaty are not considered to be participating.

5.2. Energy and the environment

5.17. Energy is indispensable to all ecosystems and is a necessary input for human-controlled processes. Energy incorporates the concept of the transformation of “available energy” into “unavailable energy” (e.g., burning of hydrocarbons) and conversion from an “unusable” to a “usable” form (e.g., hydropower to electricity). Unlike all other natural resources, energy is not a material substance but rather the capacity of a physical system to perform work. The amount of energy in a physical system remains constant and is finite, although its quality or availability diminishes through transformation.

5.18. For statistical purposes, energy is measured in its “usable form” embedded in energy products. Although physically speaking there would be no such thing as “energy production” or “energy consumption”, in statistics these terms refer to the extraction/manufacturing and use of energy products, respectively.

5.19. Energy production and consumption affects the environment in various ways. The first issue relates to the depletion of non-renewable energy resources because depletion occurs as resources are extracted. In addition, extraction of energy resources involves mining operations which disturb ecosystems, restructure the land, remove soil and water and produce wastes. Extraction techniques also result in the removal of large areas of surface vegetation, deep-well drilling and the use of heavy equipment for exploratory wells on land and offshore oil rigs to

explore ocean geology. The sheer quantity of the output of coal and the complex infrastructure required in oil and gas development have created large-scale environmental disturbances through the construction of pipelines, railways and large-scale terminal shipping facilities. This situation is further exacerbated by hazards of oil spills, well-head and pipeline explosion and fires, as well as the chemical pollution of the associated petrochemical industry.

5.20. The consumption of mineral energy resources also affects the environment. Fossil fuel combustion pollutes the air, affects human health and results in significant GHG emissions. Renewable energy does not face the depletion problem of fossil energy resources, but the capture of renewable energy can also affect the natural environment, particularly in large hydro energy facilities. Regardless of how energy is produced, its distribution requires facilities which can also change the land and affect natural areas. Each country must develop public policies to pursue the changes required in the production and consumption of energy to meet the demands of development in a sustainable and clean manner.

5.21. Sustainable Energy for All is a global initiative driving actions and mobilizing commitments to positively transform the world's energy systems since sustainable development is not possible without sustainable energy.⁹³ Access to modern energy services is fundamental to human development and an investment in our collective future. The United Nations Secretary-General's High-Level Group on Sustainable Energy for All was launched in 2011,⁹⁴ creating a Global Action Agenda to guide efforts undertaken in support of achieving the initiative's three objectives: (i) ensure universal access to modern energy services; (ii) double the rate of improvement in energy efficiency and (iii) double the share of renewable energy in the global energy mix. The objectives are to be achieved by 2030. The Agenda includes 11 action areas and provides a framework through which countries and stakeholders can create their own pathways towards achieving Sustainable Energy for All. The initiative aims to bring together leadership from all sectors of society, including business, governments, investors, community groups and academia. Sustainable Energy for All has generated significant momentum since its launch. More than 75 countries have chosen to pursue Sustainable Energy for All's objectives, from small island states to large, emerging economies.

5.22. Energy plays a critical role in socioeconomic development. The outcome document of the Rio+20 United Nations Conference on Sustainable Development, "The Future We Want", addressed energy in the context of sustainable development.⁹⁵ Among other things, it called for action to ensure "access to sustainable modern energy services for all". It also reaffirmed support for cleaner energy technologies, citing "increased use of renewable energy sources and other low-emission technologies", "more efficient use of energy" and "greater reliance on advanced energy technologies" as parts of an appropriate energy mix for meeting developmental needs. This document urged governments to create enabling environments for investment in cleaner energy technologies. The core challenge facing policymakers with regard to energy production and consumption remains in balancing the demand and need for energy with the impacts of producing and consuming it. Coordination and harmonization across all levels are thus critical as data are needed for policy, regulation and science, and to complement economic and social aspects when conducting analyses.

5.23. As such, reliable and robust energy statistics are a priority issue for the international statistical community. The United Nations Statistical Commission has discussed energy statistics since its inception. At its forty-second session (February 2011), the Commission adopted the IRES.⁹⁶ Statistics on energy production and consumption are usually compiled in both physical and monetary units, the latter being the sale of and expenditure for energy commodities (e.g., fuel and electricity). Physical measures are of key interest from an environmental perspective.

⁹³ Sustainable Energy for All (2013), available from www.se4all.org/ (accessed 4 August 2017).

⁹⁴ United Nations (2014). The Secretary-General's High-level Group on Sustainable Energy for All, available from www.se4all.org/sites/default/files/1/2013/09/9-2012-SE4ALL-ReportoftheCo-Chairs.pdf (accessed 4 August 2017).

⁹⁵ United Nations (2012). Rio+20 outcome document, "The Future We Want", available from <https://sustainabledevelopment.un.org/futurewewant.html> (accessed 4 August 2017).

⁹⁶ United Nations Statistics Division (2011). *International Recommendations for Energy Statistics (draft version)*, available from https://unstats.un.org/unsd/energy/ires/IRES_edited2.pdf (accessed 4 August 2017).

Application of the FDES to energy statistics

5.24. In the figures below, those aspects of energy statistics related to environment statistics using the FDES are described. The figures have been constructed to reflect the entire process starting from the stocks of energy resources through their extraction, the production and consumption of energy and the associated environmental effects, to relevant protection and mitigation activities.

5.25. The sequence depicted in Figures 5.5 and 5.6 for the energy theme contains four boxes. Figure 5.5 presents this information at the topic level, while Figure 5.6 provides more detail and presents the individual environment statistics which can be used to assess energy production and consumption.

Figure 5.5
Topics in the FDES that relate to the production and consumption of energy

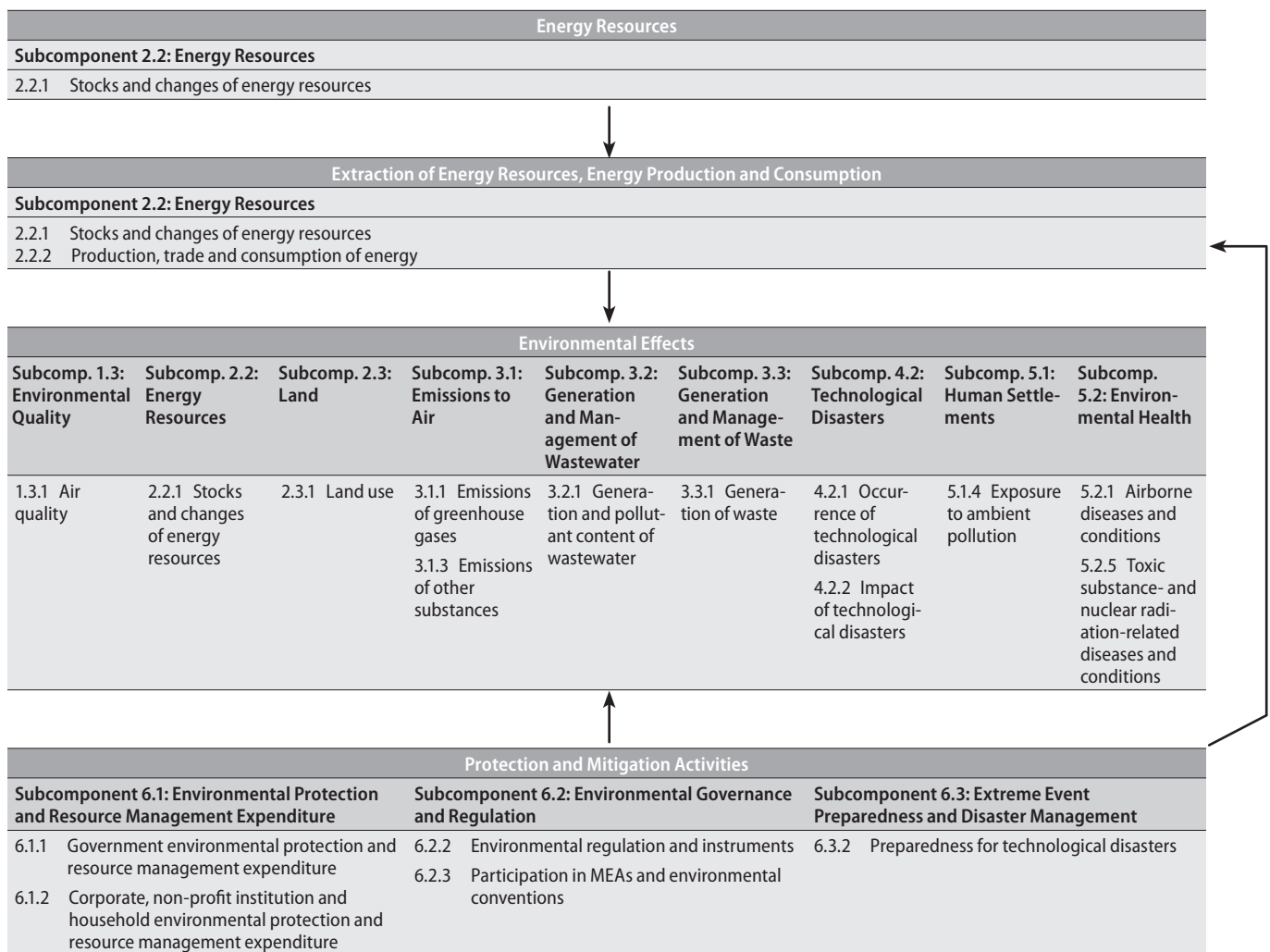


Figure 5.6
Energy production and consumption statistics in the Core Set and Basic Set of Environment Statistics

(**Bold text**—Core Set/Tier 1; regular text—Tier 2; *italicized text*—Tier 3)

Energy Resources	
Subcomponent 2.2: Energy Resources	
Topic 2.2.1: Stocks and changes of energy resources	2.2.1.a: Energy resources 2.2.1.a.1: Stocks of commercially recoverable resources 2.2.1.a.2: New discoveries <i>2.2.1.a.3: Upward reappraisals</i> <i>2.2.1.a.4: Upward reclassifications</i> 2.2.1.a.5: Extraction <i>2.2.1.a.6: Catastrophic losses</i> <i>2.2.1.a.7: Downward reappraisals</i> <i>2.2.1.a.8: Downward reclassifications</i> 2.2.1.a.9: Stocks of potentially commercially recoverable resources <i>2.2.1.a.10: Stocks of non-commercial and other known resources</i>
Extraction of Energy Minerals, Energy Production and Consumption	
Subcomponent 2.2: Energy Resources	
Topic 2.2.1: Stocks and changes of energy resources	2.2.1.a: Energy resources 2.2.1.a.5: Extraction
Topic 2.2.2: Production, trade and consumption of energy	2.2.2.a: Production of energy 2.2.2.a.1: Total production 2.2.2.a.2: Production from non-renewable sources 2.2.2.a.3: Production from renewable sources 2.2.4.a.4: Primary energy production 2.2.4.a.7: Secondary energy production 2.2.2.b: Total energy supply 2.2.2.c: Final consumption of energy
Environmental Effects	
Subcomponent 1.3: Environmental Quality	
Topic 1.3.1: Air quality	1.3.1.a: Local air quality 1.3.1.a.1: Concentration level of particulate matter (PM₁₀) 1.3.1.a.2: Concentration level of particulate matter (PM_{2.5}) 1.3.1.a.3: Concentration level of tropospheric ozone (O₃) 1.3.1.a.4: Concentration level of carbon monoxide (CO) 1.3.1.a.5: Concentration level of sulphur dioxide (SO₂) 1.3.1.a.6: Concentration levels of nitrogen oxides (NO_x) 1.3.1.a.7: Concentration levels of heavy metals 1.3.1.a.8: Concentration levels of non-methane volatile organic compounds (NMVOCs) <i>1.3.1.a.9: Concentration levels of dioxins</i> <i>1.3.1.a.10: Concentration levels of furans</i> 1.3.1.a.11: Concentration levels of other pollutants [related to energy production and consumption] 1.3.1.a.12: Number of days when maximum allowable levels were exceeded per year 1.3.1.b: Global atmospheric concentrations of greenhouse gases 1.3.1.b.1: Global atmospheric concentration level of carbon dioxide (CO ₂) 1.3.1.b.2: Global atmospheric concentration level of methane (CH ₄)
Subcomponent 2.2: Energy Resources	
Topic 2.2.1: Stocks and changes of energy resources	2.2.1.a: Energy resources 2.2.1.a.1: Stocks of commercially recoverable resources
Subcomponent 2.3: Land	
Topic 2.3.1: Land use	2.3.1.a: Area under land use categories [related to energy production and consumption]

Subcomponent 3.1: Emissions to Air	
Topic 3.1.1: Emissions of greenhouse gases	<p>3.1.1.a: Total emissions of direct greenhouse gases (GHGs), by gas [related to energy production and consumption]:</p> <p>3.1.1.a.1: Carbon dioxide (CO₂)</p> <p>3.1.1.a.2: Methane (CH₄)</p> <p>3.1.1.a.3: Nitrous oxides (N₂O)</p> <p>3.1.1.a.4: Perfluorocarbons (PFCs)</p> <p>3.1.1.a.5: Hydrofluorocarbons (HFCs)</p> <p>3.1.1.a.6: Sulphur hexafluoride (SF₆)</p> <p>3.1.1.b: Total emissions of indirect greenhouse gases (GHGs), by gas [related to energy production and consumption]:</p> <p>3.1.1.b.1: Sulphur dioxide (SO₂)</p> <p>3.1.1.b.2: Nitrogen oxides (NO_x)</p> <p>3.1.1.b.3: Non-methane volatile organic compounds (NM-VOCs)</p> <p>3.1.1.b.4: Other</p>
Topic 3.1.3: Emissions of other substances	<p>3.1.3.a: Emissions of other substances [related to energy production and consumption]</p> <p>3.1.3.a.1: Particulate matter (PM)</p> <p>3.1.3.a.2: Heavy metals</p> <p>3.1.3.a.3: <i>Other</i></p>
Subcomponent 3.2: Generation and Management of Wastewater	
Topic 3.2.1: Generation and pollutant content of wastewater	<p>3.2.1.a: Volume of wastewater generated [related to energy production and consumption]</p> <p>3.2.1.b: Pollutant content of wastewater [related to energy production and consumption]</p>
Subcomponent 3.3: Generation and Management of Waste	
Topic 3.3.1: Generation of waste	<p>3.3.1.a: Amount of waste generated by source [related to energy production and consumption]</p> <p>3.3.1.b: Amount of waste generated by waste category [related to energy production and consumption]</p> <p>3.3.1.c: Amount of hazardous waste generated [related to energy production and consumption]</p>
Subcomponent 4.2: Technological Disasters	
Topic 4.2.1: Occurrence of technological disasters	<p>4.2.1.a: Occurrence of technological disasters [related to energy production and consumption]</p> <p>4.2.1.a.1: Type of technological disaster</p> <p>4.2.1.a.2: <i>Location</i></p> <p>4.2.1.a.3: <i>Date of occurrence</i></p> <p>4.2.1.a.4: <i>Duration</i></p>
Topic 4.2.2: Impact of technological disasters	<p>4.2.2.a: People affected by technological disasters [related to energy production and consumption]</p> <p>4.2.2.a.1: Number of people killed</p> <p>4.2.2.a.2: <i>Number of people injured</i></p> <p>4.2.2.a.3: <i>Number of people homeless</i></p> <p>4.2.2.a.4: <i>Number of people affected</i></p> <p>4.2.2.b: Economic losses due to technological disasters [related to energy production and consumption]</p> <p>4.2.2.c: Physical losses/damages due to technological disasters [related to energy production and consumption]</p> <p>4.2.2.d: Effects of technological disasters on integrity of ecosystems [related to energy production and consumption]</p> <p>4.2.2.d.1: <i>Area affected by technological disasters</i></p> <p>4.2.2.d.2: <i>Loss of vegetation cover</i></p> <p>4.2.2.d.3: <i>Area of watershed affected</i></p> <p>4.2.2.d.4: <i>Other</i> (e.g., for oil spills: volume of oil released into the environment, impact on ecosystem)</p> <p>4.2.2.e: <i>External assistance received</i> [related to energy production and consumption]</p>
Subcomponent 5.1: Human Settlements	
Topic 5.1.4: Exposure to ambient pollution	5.1.4.a: Population exposed to air pollution in main cities
Subcomponent 5.2: Environmental Health	
Topic 5.2.1: Airborne diseases and conditions	<p>5.2.1.a: Airborne diseases and conditions [related to energy production and consumption]</p> <p>5.2.1.a.1: Incidence</p> <p>5.2.1.a.2: Prevalence</p> <p>5.2.1.a.3: Mortality</p> <p>5.2.1.a.4: <i>Loss of work days</i></p> <p>5.2.1.a.5: <i>Estimates of economic cost in monetary terms</i></p>
Topic 5.2.5: Toxic substance- and nuclear radiation-related diseases and conditions	<p>5.2.5.a: Toxic substance- and nuclear radiation-related diseases and conditions [related to energy production and consumption]</p> <p>5.2.5.a.1: Incidence</p> <p>5.2.5.a.2: Prevalence</p> <p>5.2.5.a.3: <i>Loss of work days</i></p> <p>5.2.5.a.4: <i>Estimates of economic cost in monetary terms</i></p>

Protection and Mitigation Activities	
Subcomponent 6.1: Environmental Protection and Resource Management Expenditure	
Topic 6.1.1: Government environmental protection and resource management expenditure	6.1.1.a: Government environmental protection and resource management expenditure [related to energy production and consumption] 6.1.1.a.1: Annual government environmental protection expenditure 6.1.1.a.2: Annual government resource management expenditure
Topic 6.1.2: Corporate, non-profit institution and household environmental protection and resource management expenditure	6.1.2.a: Private sector environmental protection and resource management expenditure [related to energy production and consumption] 6.1.2.a.1: Annual corporate environmental protection expenditure 6.1.2.a.2: <i>Annual corporate resource management expenditure</i> 6.1.2.a.3: <i>Annual non-profit institution environmental protection expenditure</i> 6.1.2.a.4: <i>Annual non-profit institution resource management expenditure</i> 6.1.2.a.5: <i>Annual household environmental protection expenditure</i> 6.1.2.a.6: <i>Annual household resource management expenditure</i>
Subcomponent 6.2: Environmental Governance and Regulation	
Topic 6.2.2: Environmental regulation and instruments	6.2.2.a: Direct regulation [related to energy production and consumption] 6.2.2.a.1: List of regulated pollutants and description (e.g., by year of adoption and maximum allowable levels) 6.2.2.a.2: Description (e.g., name, year established) of licensing system to ensure compliance with environmental standards for businesses or other new facilities 6.2.2.a.3: Number of applications for licenses received and approved per year 6.2.2.a.5: Budget and number of staff dedicated to enforcement of environmental regulations 6.2.2.b: Economic instruments [related to energy production and consumption] 6.2.2.b.1: <i>List and description</i> (e.g., year of establishment) of <i>green/environmental taxes</i> 6.2.2.b.2: <i>List and description</i> (e.g., year of establishment) of <i>environmentally relevant subsidies</i> 6.2.2.b.3: <i>List of eco-labelling and environmental certification programmes</i> 6.2.2.b.4: Emission permits traded
Topic 6.2.3: Participation in MEAs and environmental conventions	6.2.3.a: Participation in MEAs and other global environmental conventions 6.2.3.a.1: List and description (e.g., country's year of participation ^a) of MEAs and other global environmental conventions [related to energy production and consumption]
	^a Participation means that the country or area has become party to the agreements under the treaty or convention, which is achieved through various means, depending on the country's circumstances, namely: accession, acceptance, approval, formal confirmation, ratification and succession. Countries or areas that have signed but not become party to the agreements under a given convention or treaty are not considered to be participating.
Subcomponent 6.3: Extreme Event Preparedness and Disaster Management	
Topic 6.3.2: Preparedness for technological disasters	6.3.2.a: National technological disaster preparedness and management systems [related to energy production and consumption] 6.3.2.a.1: <i>Existence and description</i> (e.g., number of staff) of <i>public disaster management plans/programmes (and private when available)</i> 6.3.2.a.2: <i>Expenditure on disaster prevention, preparedness, clean-up and rehabilitation</i>

5.3. Climate change

5.26. The Conference of the Parties of the UNFCCC has affirmed that climate change is one of the greatest challenges of our time.⁹⁷ Climate change is a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.⁹⁸ The world's climate system, including the atmosphere, oceans and cryosphere, is changing and will continue to change at rates unprecedented in recent human history. Findings on the scientific basis for climate change suggest that a number of human-induced alterations of the natural world are involved. These alterations affect the global energy balance (the balance between incoming energy from the sun and outgoing heat from the earth) and ultimately lead to climate change.

5.27. The Kyoto Protocol is an international agreement linked to the UNFCCC. Its main feature is that it sets binding targets for 37 industrialized countries and the European community to reduce GHG emissions, rather than simply encouraging them to attain these goals, as is the case with the Framework Convention. The targets amount to an average of five per

⁹⁷ United Nations Framework Convention on Climate Change (2011). "Report of the Conference of the Parties on its sixteenth session, held in Cancun from 29 November to 10 December 2010", available from <http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf> (accessed 4 August 2017).

⁹⁸ United Nations Framework Convention on Climate Change (1992), available from https://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveg.pdf (accessed 4 August 2017).

cent against 1990 levels over the five-year period 2008-2012.⁹⁹ In 2012, the Doha Amendment (to the Kyoto Protocol) was adopted. This amendment further contributed to reducing GHG emissions by at least 18 percent below 1990 levels in the eight years from 2013 to 2020. It also expands the list of GHGs regulated by the Kyoto Protocol.¹⁰⁰ These conventions and protocols involve reporting obligations, which in turn create additional data requirements and demand for environment statistics.

5.28. The Rio+20 United Nations Conference on Sustainable Development reaffirmed the pre-eminence of climate change, expressing alarm about the rise of GHGs globally. In its outcome document, it called for cooperative action to coordinate effective international response to this challenge to ensure reduction of the emission of GHGs. It noted that countries already experience adverse impacts of climate change such as persistent drought, extreme weather events, sea-level rise and threats to food security. In this regard, the Conference indicated adaptation to climate change to be an “urgent global priority”.¹⁰¹

5.29. The IPCC has developed a sequence of events that describes the complexity of climate change using a schematic framework (see Figure 5.7). The cross-cutting application of the FDES is based on this framework.

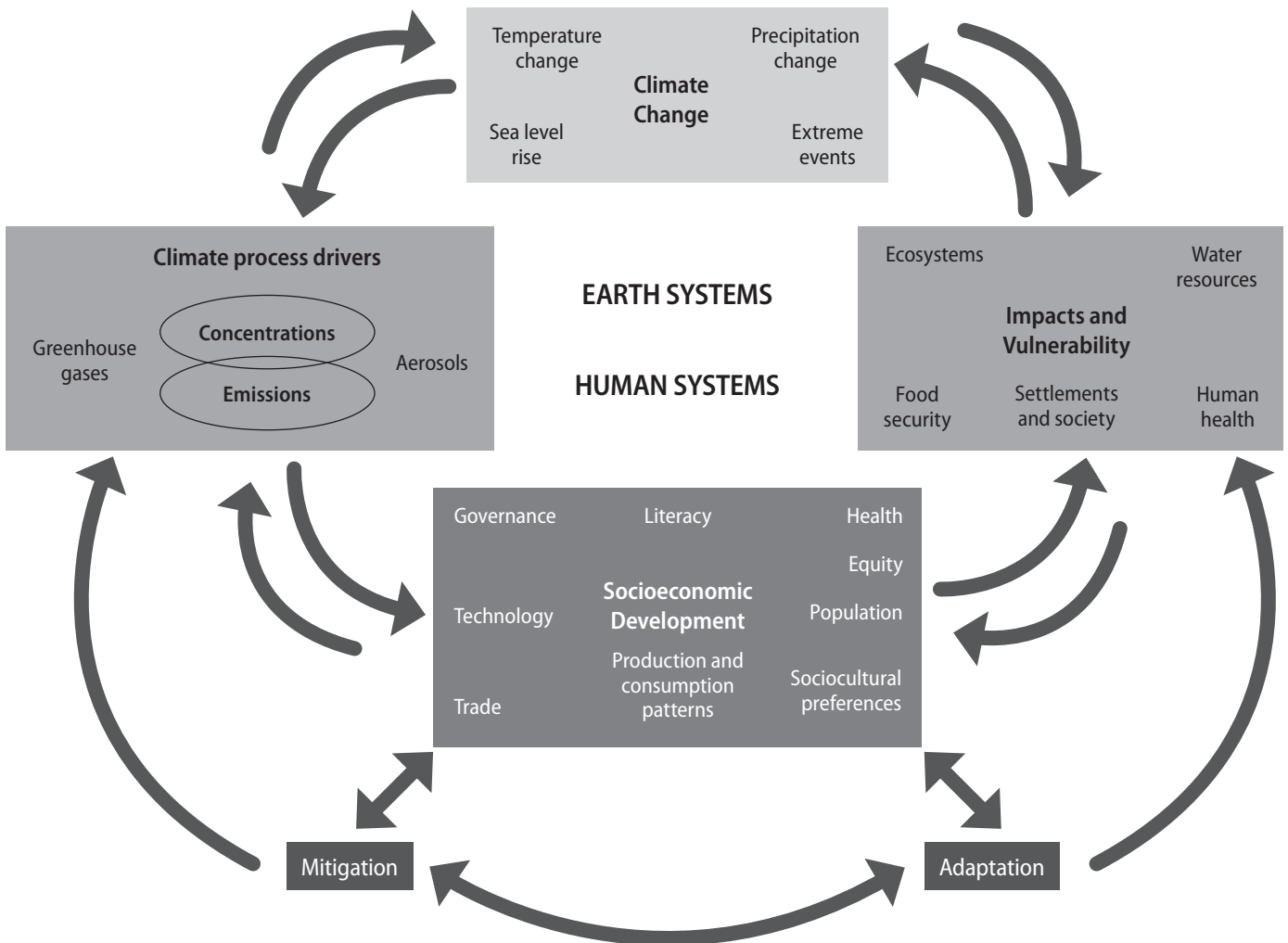
⁹⁹ United Nations Framework Convention on Climate Change (2014). Kyoto Protocol, available from http://unfccc.int/kyoto_protocol/items/2830.php (accessed 4 August 2017).

¹⁰⁰ United Nations Framework Convention on Climate Change (2014). Doha Amendment, available from http://unfccc.int/kyoto_protocol/doha_amendment/items/7362.php (accessed 4 August 2017).

¹⁰¹ United Nations (2012). Rio+20 outcome document, “The Future We Want”, available from <https://sustainabledevelopment.un.org/futurewewant.html> (accessed 4 August 2017).

¹⁰² Intergovernmental Panel on Climate Change. “Climate Change 2007: Synthesis Report”, available from www.ipcc.ch/publications_and_data/ar4/syr/en/spms1.html (accessed 4 August 2017).

Figure 5.7
Schematic framework representing anthropogenic drivers, impacts of and responses to climate change, and their linkages¹⁰²



5.30. As seen, climate change occurs through a chain of events and can be observable at all levels, from local to global. Climate process drivers are GHG emissions associated with current production and consumption patterns, which depend heavily on fossil fuels for energy and transportation. These persistently high emissions lead to high atmospheric CO₂ concentrations, which in turn prevent heat from escaping the earth resulting in increased temperature and humidity, thus changing climate patterns. The evidence of global warming and climate change is unequivocal,¹⁰³ including global temperature rise, extreme events, sea level rise, shrinking ice sheets and glacial retreat.¹⁰⁴ Climate change evidence refers to the processes that substantiate the occurrence of changing climate patterns at the global, regional and local levels. Climate change impacts include, among many others, more intense storms, changes in agricultural productivity, water scarcity and coral bleaching. Mitigation and adaptation processes are another important part of the sequence of climate change. Mitigation aims to decrease sources of GHGs, while climate change adaptation is an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.¹⁰⁵

5.31. Climate change mitigation refers to efforts to reduce or prevent greenhouse gas emissions and may involve using new technologies, incorporating and increasing renewable energies, making older equipment more energy efficient and changing management practices or consumer behaviour. Efforts underway around the world range from building high-tech subway systems to installing bicycling paths and walkways. Protecting natural carbon sinks like forests and oceans, or creating new sinks through silviculture or green agriculture, are also elements of mitigation.¹⁰⁶ The development and deployment of renewable energy technologies and more efficient use of renewable energy sources will play a significant role in mitigation of GHG emissions, thereby presenting important opportunities to mitigate climate change and contribute to sustainable development. Harnessing solar and wind energy, production of biofuels through new processes, enhanced geothermal systems and emerging ocean technologies are some areas of potential advancement in this regard. Current strategies to foster renewable energies, including direct regulation and the creation of economic instruments, must also be monitored.

5.32. Climate change impact and risks associated with climate change are real and are already evident in many systems and sectors essential for human livelihood, including water resources, food security, coastal zones and health. Weather patterns have become more extreme, with more intense and longer events such as droughts, floods and increased precipitation over many land areas, as well as more hot days and heat waves. Associated risks include more frequent and dangerous floods and storms, greater stress on water supplies, decline in agricultural productivity and food security and further spread of water-related diseases, particularly in tropical areas.

5.33. The UNFCCC has identified climate adaptation as a key building block for a coordinated response to climate change. The IPCC describes adaptation as an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.¹⁰⁷ Adaptation does not take place in response to climatic changes in isolation, but instead is a response to a series of events or to previously existing situations that are exacerbated through climate change. As a consequence, it can be difficult to determine which aspects of adaptation are driven solely or partially by climate change, as opposed to other factors not related to climate change. This makes it difficult and challenging to measure adaptation to climate change accurately. In addition, few comprehensive studies exist on what adaptation to climate change entails, as well as the costs and benefits of adaptation measures. Nonetheless, adaptation is an important and necessary response to climate change and statistics and methodologies to assess adaptation should be developed.

¹⁰³ Evidence of warming oceans, declining arctic sea ice (extent and thickness) and ocean acidification also exists. National Aeronautics and Space Administration. "Global Climate Change. Vital Signs of the Planet"; available from <http://climate.nasa.gov/evidence/> (accessed 4 August 2017).

¹⁰⁴ United Nations Framework Convention on Climate Change (2013). "Glossary of Climate Change Acronyms", available from http://unfccc.int/essential_background/glossary/items/3666.php#A (accessed 4 August 2017).

¹⁰⁵ United Nations Framework Convention on Climate Change (2013). "Glossary of Climate Change Acronyms", available from http://unfccc.int/essential_background/glossary/items/3666.php#A (accessed 4 August 2017).

¹⁰⁶ United Nations Environment Programme. Environment for Development—Climate Change Mitigation, available from www.unep.org/climatechange/mitigation/ (accessed 4 August 2017).

¹⁰⁷ Intergovernmental Panel on Climate Change, Fourth Assessment Report (2007). "Climate Change 2007: Impacts, Adaptation and Vulnerability", Cambridge University Press. Available from www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4_wg2_full_report.pdf (accessed 4 August 2017).

Statistics on Climate Change

5.34. A scientific approach to climate change must be supported by well structured, relevant, reliable and timely statistics. Simultaneously, the need for underlying data to inform the policy aspects of climate change remains a pressing requirement. Given their cross-cutting nature, climate change statistics are relevant to a large proportion of the domain of environment statistics.

5.35. The UNECE is working actively with its member countries and other international organisations to develop climate change-related statistics.¹⁰⁸ These efforts primarily address data that are already collected by statistical offices and can support climate change-related analysis or research. The work does not focus on scientific data (e.g., meteorological data) that measure changes in weather and climate. The CES set up a Task Force on Climate Change-Related Statistics in November 2011. Its work produced the CES' Recommendations on Climate Change-Related Statistics, which were endorsed by the CES plenary session in April 2014.¹⁰⁹ According to UNECE, climate change-related statistics refer to environmental, social and economic data that measure the human causes of climate change, the impacts of climate change on human and natural systems, and the efforts by humans to avoid and adapt to these consequences.¹¹⁰

5.36. The information required to analyse climate change includes economic, social and environmental aspects. The FDES provides a set of environmental topics and individual environment statistics that are important when informing any country on climate change. These statistics should be complemented with both social and economic statistics to provide a comprehensive set of information.

5.37. With regard to determining and apportioning the appropriate environment statistics for measurement of climate change, it is important to consider a sequence of changes. Statistics pertaining to the different steps of the sequence depicted in Figure 5.7 are needed to monitor climate change and observe its impact on countries and regions.

5.38. At present, the availability of relevant statistics in most countries varies across the stages in the sequence. Data on drivers of climate change, climate change evidence, impacts of climate change, such as natural extreme events and disasters, and mitigation activities are all fairly developed. However, other impacts of climate change, such as those on ecosystems, are more difficult to measure and because changes in the climate are not the only explanation of those impacts. Despite their importance, vulnerability and adaptation statistics are still at the early stage of development. Considerable statistical progress is expected and needed in these two areas in the upcoming years.

5.39. When compiling statistics on climate change at the national level in a particular country, it is important to assess relevance, as well as policy and legal aspects. The relevance of climate change varies by country, given different political dynamics and the country's characteristics in terms of carbon intensity and its vulnerability to climate change impact. Climate change policies also vary by country. For example, specific climate change strategies and mitigation and adaptation programmes may be in place or the country may be participating in a programme to mitigate carbon emissions. When preparing climate change statistics, it is important to first understand the national relevance, conceptual aspects, existing policies and reporting needs so that the appropriate statistics may be compiled to inform these policies. Similarly, on the international level, it is important to understand a country's participation¹¹¹ in specific conventions and related MEAs when preparing climate change statistics.

5.40. The impacts of climate change most often manifest locally and vary greatly by location. As such, spatial considerations must be taken into account when assessing climate change and spatial aspects must be included in climate change statistics whenever possible. This enables policymakers and researchers to better determine the impacts from climate change and the appropriate mitigation strategies.

¹⁰⁸ United Nations Economic Commission for Europe (2014). "Climate change-related statistics", available from www.unece.org/stats/climate.html (accessed 4 August 2017).

¹⁰⁹ United Nations Economic Commission for Europe (2014). "Recommendations on Climate Change-Related Statistics", available from www.unece.org/fileadmin/DAM/stats/publications/2014/CES_CC_Recommendations.pdf (accessed 4 August 2017).

¹¹⁰ United Nations Economic Commission for Europe (2014). "Climate change-related statistics", available from www.unece.org/stats/climate.html (accessed 4 August 2017).

¹¹¹ Participation means that the country or area has become party to the agreements under the treaty or convention, which is achieved through various means, depending on the country's circumstances, namely: accession, acceptance, approval, formal confirmation, ratification and succession. Countries or areas that have signed but not become party to the agreements under a given convention or treaty are not considered to be participating.

Application of the FDES to climate change statistics

5.41. The following figures provide an example of the application of the FDES to climate change. Many topics and individual statistics that fall under different components of the FDES may be used to provide information on the various aspects of climate change. The following figures 5.8 and 5.9 organize the pertinent subcomponents, topics and statistics of the Basic Set according to the sequence of climate change-related events as per the IPCC (Figure 5.7), with one modification—only those elements that fall under the realm of environment statistics are addressed under “Socioeconomic Development”.

5.42. The climate change sequence depicted in Figures 5.8 and 5.9 thus contains four boxes that present the stages of Climate Process Drivers, Climate Change Evidence, Climate Change Impacts and Vulnerability, and Mitigation and Adaptation.

5.43. Figure 5.8 presents the relevant information at the topic level, while Figure 5.9 provides more details and presents the individual environment statistics which can be used to assess climate change. Following the figures, an illustrative, non-exhaustive list of other commonly used indicators, statistics and statistical themes has also been provided for general reference purposes.

Figure 5.8
Topics in the FDES that relate to climate change

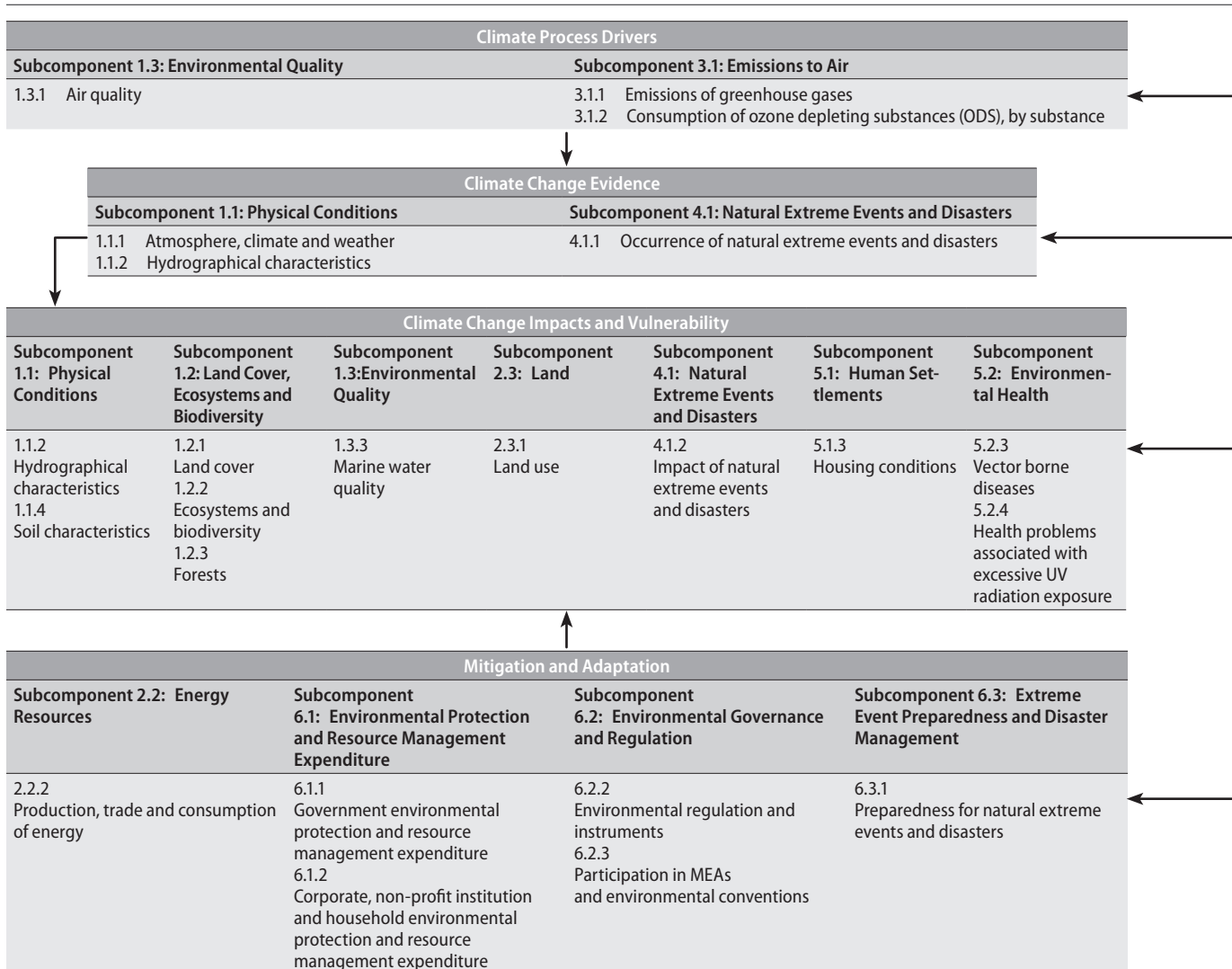


Figure 5.9
Climate change statistics in the Core Set and Basic Set of Environment Statistics

(**Bold text**—Core Set/Tier 1; regular text—Tier 2; *italicized text*—Tier 3)

Climate Process Drivers	
Subcomponent 1.3: Environmental Quality	
Topic 1.3.1: Air quality	1.3.1.b: Global atmospheric concentrations of greenhouse gases 1.3.1.b.1 Global atmospheric concentration level of carbon dioxide (CO ₂) 1.3.1.b.2 Global atmospheric concentration level of methane (CH ₄)
Subcomponent 3.1: Emissions to Air	
Topic 3.1.1: Emissions of greenhouse gases	3.1.1.a: Total emissions of direct greenhouse gases (GHGs), by gas: 3.1.1.a.1: Carbon dioxide (CO₂) 3.1.1.a.2: Methane (CH₄) 3.1.1.a.3: Nitrous oxide (N₂O) 3.1.1.a.4: Perfluorocarbons (PFCs) 3.1.1.a.5: Hydrofluorocarbons (HFCs) 3.1.1.a.6: Sulphur hexafluoride (SF ₆) 3.1.1.b: Total emissions of indirect greenhouse gases (GHGs), by gas: 3.1.1.b.1: Sulphur dioxide (SO₂) 3.1.1.b.2: Nitrogen oxides (NO_x) 3.1.1.b.3: Non-methane volatile organic compounds (NM-VOCs) 3.1.1.b.4: Other
Topic 3.1.2: Consumption of ozone depleting substances	3.1.2.a: Consumption of ozone depleting substances (ODS), by substance: 3.1.2.a.1: Chlorofluorocarbons (CFCs) 3.1.2.a.2: Hydrochlorofluorocarbons (HCFCs) 3.1.2.a.3: Halons 3.1.2.a.4: Methyl chloroform 3.1.2.a.5: Carbon tetrachloride 3.1.2.a.6: Methyl bromide 3.1.2.a.7: Other
Climate Change Evidence	
Subcomponent 1.1: Physical Conditions	
Topic 1.1.1: Atmosphere, climate and weather	1.1.1.a: Temperature 1.1.1.a.1: Monthly average 1.1.1.a.2: Minimum monthly average 1.1.1.a.3: Maximum monthly average 1.1.1.b: Precipitation (also in 2.6.1.a) 1.1.1.b.1: Annual average 1.1.1.b.2: Long-term annual average 1.1.1.b.3: Monthly average 1.1.1.b.4: Minimum monthly value 1.1.1.b.5: Maximum monthly value
Topic 1.1.2: Hydrographical characteristics	1.1.2.e: Seas <i>1.1.2.e.4: Sea level</i>
Subcomponent 4.1: Natural Extreme Events and Disasters	
Topic 4.1.1: Occurrence of natural extreme events and disasters	4.1.1.a: Occurrence of natural extreme events and disasters 4.1.1.a.1: Type of natural extreme event and disaster (geophysical, meteorological, hydrological, climatological, biological) 4.1.1.a.2: Location 4.1.1.a.3: Magnitude (where applicable) 4.1.1.a.4: Date of occurrence 4.1.1.a.5: Duration

Climate Change Impacts and Vulnerability	
Subcomponent 1.1: Physical Conditions	
Topic 1.1.2: Hydrographical characteristics	1.1.2.a: Lakes 1.1.2.a.1: Surface area 1.1.2.a.2: <i>Maximum depth</i> 1.1.2.b: Rivers and streams 1.1.2.b.1: Length 1.1.2.c: Artificial reservoirs 1.1.2.c.1: <i>Surface area</i> 1.1.2.c.2: <i>Maximum depth</i> 1.1.2.e: Seas 1.1.2.e.5: <i>Area of sea ice</i> 1.1.2.g: Glaciers
Topic 1.1.4: Soil characteristics	1.1.4.b: Soil degradation 1.1.4.b.2: Area affected by desertification
Subcomponent 1.2: Land Cover, Ecosystems and Biodiversity	
Topic 1.2.1: Land cover	1.2.1.a: Area under land cover categories
Topic 1.2.2: Ecosystems and biodiversity	1.2.2.a: General ecosystem characteristics, extent and pattern 1.2.2.a.1: Area of ecosystems 1.2.2.b: Ecosystems' chemical and physical characteristics 1.2.2.b.2: <i>Carbon</i> 1.2.2.c: Biodiversity 1.2.2.c.1: Known flora and fauna species 1.2.2.c.2: Endemic flora and fauna species 1.2.2.c.3: Invasive alien flora and fauna species 1.2.2.c.4: Species population 1.2.2.c.5: <i>Habitat fragmentation</i>
Topic 1.2.3: Forests	1.2.3.a: Forest area 1.2.3.a.1: Total 1.2.3.a.2: Natural 1.2.3.a.3: Planted 1.2.3.a.4: Protected forest area (also in 1.2.2.d) 1.2.3.a.5: Forest area affected by fire 1.2.3.b: Forest biomass 1.2.4.b.1: Total 1.2.4.b.2: <i>Carbon storage in living forest biomass</i>
Subcomponent 1.3: Environmental Quality	
Topic 1.3.3: Marine water quality	1.3.3.b: Organic matter 1.3.3.b.1: Biochemical oxygen demand (BOD) 1.3.3.b.2: Chemical oxygen demand (COD) 1.3.3.f: Physical and chemical characteristics [of marine water bodies] 1.3.3.f.1: <i>pH/acidity/alkalinity</i> 1.3.3.f.2: Temperature 1.3.3.f.3: <i>Total suspended solids (TSS)</i> 1.3.3.f.4: <i>Salinity</i> 1.3.3.f.5: Dissolved oxygen (DO) 1.3.3.f.6: <i>Density</i> 1.3.3.g: Coral bleaching 1.3.3.g.1: Area affected by coral bleaching
Subcomponent 2.3: Land	
Topic 2.3.1: Land use	2.3.1.a: Area under land use categories
Topic 2.3.2: Use of forest land	2.3.2.a: Use of forest land 2.3.2.a.1: Area deforested 2.3.2.a.2: Area reforested 2.3.2.a.3: Area afforested 2.3.2.a.4: <i>Natural growth</i>

Subcomponent 4.1: Natural Extreme Events and Disasters	
Topic 4.1.2: Impact of natural extreme events and disasters	<p>4.1.2.a: People affected by natural extreme events and disasters</p> <p>4.1.2.a.1: Number of people killed</p> <p>4.1.2.a.2: Number of people injured</p> <p>4.1.2.a.3: Number of people homeless</p> <p>4.1.2.a.4: Number of people affected</p> <p>4.1.2.b: Economic losses due to natural extreme events and disasters</p> <p>4.1.2.c: Physical losses/damages due to natural extreme events and disasters</p> <p>4.1.2.d: Effects of natural extreme events and disasters on integrity of ecosystems</p> <p>4.1.2.d.1: Area affected by natural disasters</p> <p>4.1.2.d.2: Loss of vegetation cover</p> <p>4.1.2.d.3: Area of watershed affected</p> <p>4.1.2.d.4: Other</p>
Subcomponent 5.1: Human Settlements	
Topic 5.1.3: Housing conditions	<p>5.1.3.c: Population living in hazard-prone areas</p> <p>5.1.3.d: Hazard-prone areas</p>
Subcomponent 5.2: Environmental Health	
Topic 5.2.3: Vector-borne diseases	<p>5.2.3.a: Vector-borne diseases</p> <p>5.2.3.a.1: Incidence</p> <p>5.2.3.a.2: Prevalence</p> <p>5.2.3.a.3: Mortality</p> <p>5.2.3.a.4: Loss of work days</p> <p>5.2.3.a.5: Estimates of economic cost in monetary terms</p>
Topic 5.2.4: Health problems associated with excessive UV radiation exposure	<p>5.2.4.a: Problems associated with excessive UV radiation exposure</p> <p>5.2.4.a.1: Incidence</p> <p>5.2.4.a.2: Prevalence</p> <p>5.2.4.a.3: Loss of work days</p> <p>5.2.4.a.4: Estimates of economic cost in monetary terms</p>
Mitigation and Adaptation	
Subcomponent 2.2: Energy Resources	
Topic 2.2.2: Production, trade and consumption of energy	<p>2.2.2.a: Production of energy</p> <p>2.2.2.a.3: Production from renewable sources</p>
Subcomponent 6.1: Environmental Protection and Resource Management Expenditure	
Topic 6.1.1: Government environmental protection and resource management expenditure	<p>6.1.1.a: Government environmental protection and resource management expenditure [on climate change mitigation activities]</p> <p>6.1.1.a.1: Annual government environmental protection expenditure</p> <p>6.1.1.a.2: Annual government resource management expenditure</p>
Topic 6.1.2: Corporate, non-profit institution and household environmental protection and resource management expenditure	<p>6.1.2.a: Private sector environmental protection and resource management expenditure [on climate change mitigation activities]</p> <p>6.1.2.a.1: Annual corporate environmental protection expenditure</p> <p>6.1.2.a.2: Annual corporate resource management expenditure</p> <p>6.1.2.a.3: Annual non-profit institution environmental protection expenditure</p> <p>6.1.2.a.4: Annual non-profit institution resource management expenditure</p> <p>6.1.2.a.5: Annual household environmental protection expenditure</p> <p>6.1.2.a.6: Annual household resource management expenditure</p>
Subcomponent 6.2: Environmental Governance and Regulation	
Topic 6.2.2: Environmental regulation and instruments	<p>6.2.2.a: Direct regulation</p> <p>6.2.2.a.1: List of regulated pollutants and description (e.g., by year of adoption and maximum allowable levels) [related to climate change]</p> <p>6.2.2.a.2: Description (e.g., name, year established) of licensing system to ensure compliance with environmental standards for businesses or other new facilities [related to climate change]</p> <p>6.2.2.a.3: Number of applications for licences received and approved per year [related to climate change]</p> <p>6.2.2.a.4: List of quotas for biological resource extraction</p> <p>6.2.2.a.5: Budget and number of staff dedicated to enforcement of environmental regulations [related to climate change]</p> <p>6.2.2.b: Economic instruments [related to climate change]</p> <p>6.2.2.b.1: List and description (e.g., year of establishment) of green/environmental taxes</p> <p>6.2.2.b.2: List and description (e.g., year of establishment) of environmentally relevant subsidies</p> <p>6.2.2.b.3: List of eco-labelling and environmental certification programmes</p> <p>6.2.2.b.4: Emission permits traded</p>
Topic 6.2.3: Participation in MEAs and other global environmental conventions	<p>6.2.3.a: Participation in MEAs and other global environmental conventions</p> <p>6.2.3.a.1: List and description (e.g., country's year of participation^a) of MEAs and other global environment conventions [related to climate change]</p>
	<p>^a Participation means that the country or area has become party to the agreements under the treaty or convention, which is achieved through various means, depending on the country's circumstances, namely: accession, acceptance, approval, formal confirmation, ratification and succession. Countries or areas that have signed but not become party to the agreements under a given convention or treaty are not considered to be participating.</p>

Subcomponent 6.3: Extreme Event Preparedness and Disaster Management	
Topic 6.3.1: Preparedness for natural extreme events and disasters	6.3.1.a: National natural extreme event and disaster preparedness and management systems
	6.3.1.a.1: Existence of national disaster plans/programmes
	6.3.1.a.2: Description (e.g. number of staff) of national disaster plans/programmes

5.4. Agriculture and the environment

5.44. Agriculture is essential to sustaining livelihoods, securing food production and providing income. Agriculture is an environment-dependent activity that involves the use of ecosystem goods and services, and environmental resources such as land, soil resources, water resources and energy resources. Agriculture is the largest water consumer in the world.¹¹²

5.45. Sustainable agricultural production contributes to long-term food security. The promotion and support of sustainable agriculture that conserves land, water, biodiversity and ecosystems, while enhancing resilience to climate change and natural disasters, has been agreed upon internationally, as has the need to maintain natural ecological processes.¹¹³

5.46. Large scale or intensive agriculture requires the increasing use of chemicals, infrastructure and machinery. In its effort to improve crop production, agriculture has become an industry which uses more and more anthropogenic inputs in the form of chemical fertilizers, pesticides and modified genetic material. Changes to soil chemistry through fertilizer and pesticide applications, as well as alteration of ecosystems and biota through introduction of genetic material, all influence the health and well-being of humans and other living beings. Agricultural infrastructure (e.g., access roads and networks for delivery of products), immovable irrigation infrastructure, dam construction for access to water resources, as well as wind and solar energy infrastructure for exploiting groundwater resources, all contribute to changes in the ecosystems.

5.47. Many advances in conventional agricultural production in recent decades have been realized with little or no regard for biodiversity. Modern agricultural practices, which intensify a given crop's production yields, have led to gross simplification of agricultural systems and biodiversity resulting in an increasing need to conserve existing biodiversity. This has generated substantial efforts to develop holistic approaches to agricultural management including, for example, organic farming and integrated pest management. These are now very recognized practices in many parts of the world and can reduce the environmental impact of farming significantly.

5.48. The increased use of GMOs in modern agriculture has had some negative impact on biodiversity, although higher-yielding, pesticide-resistant, genetically modified crops may also reduce GHG emissions. More and better monitoring data are needed to assess these effects.

5.49. Agriculture both contributes to and is seriously influenced by climate change. It creates GHG emissions by decreasing carbon sinks (via deforestation and wetland conversion), contributes to methane emissions (via rice cultivation and ruminant livestock), releases nitrous oxide through nitrogen fertilizers, and emits CO₂ via machinery and transport. In turn, as a result of climate change, agriculture faces changes in water availability, increased exposure to heat stress, changed distribution of pests and diseases, increased leaching of nutrients from soil, greater soil erosion from stronger winds and rainfall, and an increased frequency of wildfires.

5.50. On the other hand, agriculture also provides opportunities to tackle climate change. This can take three forms: a) decreasing GHG emissions via improved agricultural management of livestock and rice cultivation; b) improving the carbon sink function of agricultural soils and of vegetation on agricultural land; and c) contributing to the development of renewable energy sources via agricultural biomass, e.g., from manure or crop residues.

¹¹² United Nations Educational, Scientific, and Cultural Organization (2014). World Water Assessment Programme" available from www.unesco.org/new/en/natural-sciences/environment/water/wwap/facts-and-figures/all-facts-wwdr3/fact2-agricultural-use/ (accessed 4 August 2017).

¹¹³ United Nations (2012). Rio+20 outcome document, "The Future We Want, available from <https://sustainabledevelopment.un.org/futurewewant.html> (accessed 4 August 2017).

5.51. Flows and balances of nutrients and their contribution to soil fertility are critical to agricultural production. Overall, human society has more than doubled the worldwide terrestrial cycling of nitrogen and phosphorous and has created an imbalance in these nutrients. This is leading to environmental problems such as soil degradation and loss of soil fertility. Improving nutrient efficiency in crop and animal production is integral to mitigating this problem.

5.52. Regarding livestock production, growth and productivity gains are frequently achieved through the use of antibiotics, hormones, genetic material and intensive feeding practices on pasture, rangeland and feedlots. Bacteria in poultry litter, veterinary antibiotics, anti-parasitic medicines and hormones are just a fraction of the contaminants introduced into the environment through livestock production. The cumulative effect of releases from livestock production and agriculture creates a pressing need to monitor the environmental consequences. However, there are still many rangeland systems that make positive contributions to biodiversity and landscapes.

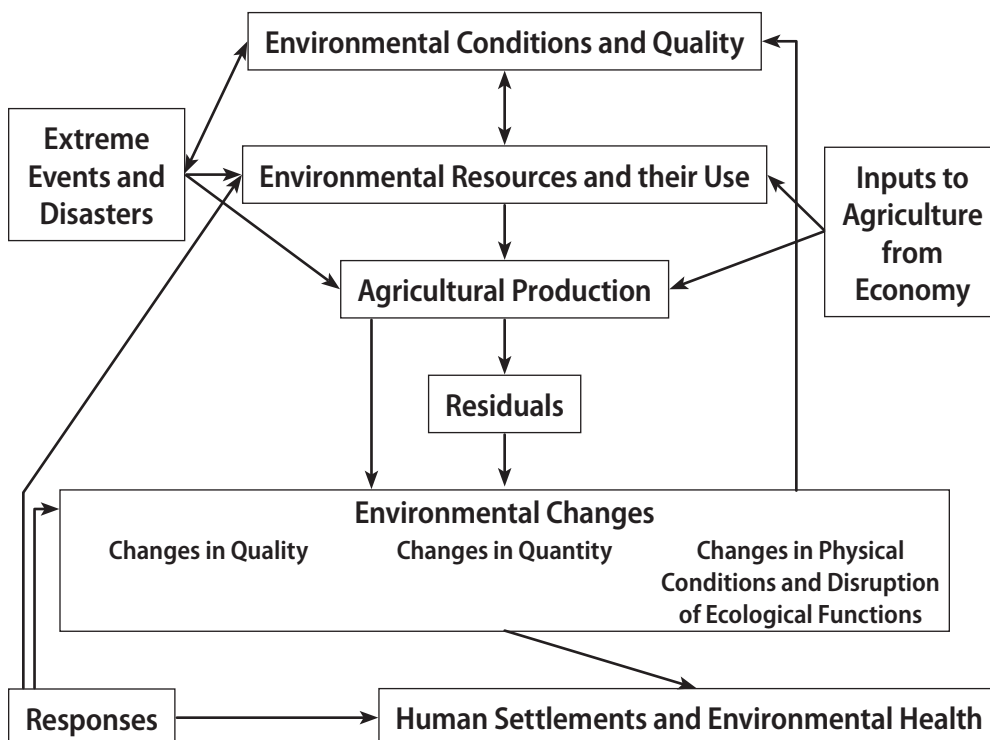
Application of the FDES to agriculture and the environment

5.53. In this cross-cutting issue, the scope of agriculture is set out according to groups 011 through 016 in ISIC Rev. 4, which comprise crop and animal production.¹¹⁴ Although the scope is restricted to these contents, using the pattern applied below, similar exercises may be conducted for forestry, aquaculture and agro-industrial activities and their relationship to the environment.

5.54. Figure 5.10 is a schematic presentation of the relationship between agriculture and the environment. It also helps to illustrate how the FDES can be applied to study these relationships.

¹¹⁴ United Nations Statistics Division (2008). *International Standard Industrial Classification of All Economic Activities (ISIC), Rev. 4*, available from <http://unstats.un.org/unsd/cr/registry/isic-4.asp> (accessed 4 August 2017).

Figure 5.10
The relationship between agriculture and the environment



5.55. Environmental Conditions and Quality (FDES Component 1) largely determine the agricultural potential of a country. These environmental conditions (such as climate and weather, hydrological conditions, terrain, soil types and fertility levels) actually provide the basic ecological foundation for agriculture.

5.56. Agricultural production uses environmental resources (FDES Component 2) such as land, soil resources, water resources and energy resources. The resources are modified both qualitatively and quantitatively. For example, water may become polluted and overused, or nutrients from soil may be depleted and require replenishment by artificial means. Other natural inputs and processes are also necessary to produce crops and livestock—namely, the permanent flux of solar luminescence, photosynthesis and a wide range of other ecosystem services. Additionally, manufactured inputs such as fertilizers, pesticides and other agrochemicals (for crops), antibiotics and hormones (for livestock) are also used in agricultural production and released to the environment.

5.57. Various farming methods such as traditional, extensive, monoculture or organic may be used to produce different types of crops and livestock (FDES Component 2). Therefore, the intake of resources and agrochemicals, as well as the residuals, could be more or less sustainable, depending on the state, conditions and resilience of surrounding environments. Monitoring yields and their changes through time and space provides additional information to assess the sustainability and health of ecosystems.

5.58. Agricultural processes generate different kinds of residuals (FDES Component 3). Emissions to water occur from the use of agrochemicals. Agricultural emissions to air and atmosphere resulting from land use change associated with agriculture (i.e., deforestation), the use of fossil fuels for energy and transportation in agriculture, and livestock digestive functions (methane) are also important, particularly in terms of contributing to climate change. Agriculture can also emit ODSs, particularly methyl bromide, into the environment. It is known to be used as a soil and structural fumigant to control pests in many countries. The application of and the residuals from agricultural substances, such as fertilizers and pesticides are an environmental health concern. Residuals in soil from the use of agrochemicals play an important role in determining its quality, productive capacity and pollution levels.

5.59. Agricultural waste is composed, to a great extent, of organic materials such as harvest remains from grain, oilseed, vegetable and orchard crops. It also includes manure and animal output, in solid or liquid form, from livestock operations. Organic waste is a resource whenever it is reused or recycled, for example, to produce organic fertilizer from biomass and manure. Other examples of solid waste include empty pesticide and fertilizer containers, old silage wrap, expired pesticides, medicines, used oil, gasoline and diesel containers, and used tyres.

5.60. Extreme events and natural disasters (FDES Component 4) can also affect environmental resource stocks and, therefore, their use, as well as the production and yields of agriculture and livestock. More intensive droughts, floods, landslides, hurricanes and storms impact the state of the environment and the ecological functions that support agriculture. They can severely affect soil, land and biological resources to be used or already in use, as well as the productivity of these environmental resources. Extreme events and disasters can directly affect the soil and land under crops or pastures, and can also affect the water cycle and critical watersheds. They can impact relevant infrastructure and even damage crops and livestock, depending on the intensity, duration and nature of the extreme event and disaster, the ecosystem's resilience and society's preparedness and response.

5.61. Overall, agricultural activities change the environment. They can transform ecosystems and physical conditions (FDES Component 1) via irrigation, drainage, deforestation, and the use of fertilizers and pesticides. They modify the quality and quantity of environmental

resources (FDES Component 2) being used or to be used in the future, depending on the type and extent of the agricultural activities and the resilience of the environment. These changes may be qualitative and quantitative in nature. Qualitative transformation becomes an environmental issue when it concerns pollution, i.e., the biological and chemical pollution of water and the eutrophication of rivers, lakes and seas, the pollution of soil or its degradation particularly in specific sites and zones, and the air and atmospheric pollution already described under residuals. Quantitative changes include considerable land use changes (e.g., loss of natural ecosystems such as forest to pastures and crops), increased or new water stress, overuse and depletion of water, and contribution to soil erosion and degradation. Finally, agriculture may lead to changes in physical conditions such as temperature, humidity and precipitation from climate change, and disruptions of ecological functions such as biodiversity loss (terrestrial and aquatic) around agricultural areas and the introduction of invasive species.

5.62. These changes in the environment will also affect human environmental health (FDES Component 5). Of particular importance are human health problems related to toxic substance exposure. The use of toxic substances in agriculture, such as those in pesticides (fungicides, herbicides, insecticides and rodenticides) and their potential appearance in food, air or water, are important environmental and health concerns.

5.63. Information on society's responses aimed at protecting, managing and restoring environmental resources (water resources, energy resources, soil resources and land) and at reducing the negative environmental impacts of agricultural activities is important (FDES Component 6). The relevant information about environmental protection expenditure, economic measures, actions and programmes aimed at protecting and restoring soil and water functions to sustainable levels, as well as promoting organic and sustainable agriculture, cleaner energy production and efficiency in agriculture, is significant. These social efforts can diminish the negative impacts and effects of agriculture on the environment and human health. Depending on the magnitude of impacts over time and across space, they could even restore the environmental quality and conditions and ensure the sustainable use of environmental resources.

5.64. The statistical description of the relationship between agriculture and the environment brings together statistical topics and statistics from all components of the FDES. In addition, supporting statistics are needed that are commonly available from agricultural, economic and social statistics. Geospatial statistics and GIS are playing an increasing role in complementing traditional data in this area.

5.65. In the figures below, the FDES has been applied specifically to organize the relevant environment statistics needed to inform about issues related to agriculture and the environment. Figures 5.11 and 5.12 illustrate how the contents of the FDES and its Core Set and Basic Set of Environment Statistics can be used to select and relate its relevant parts to properly describe the relationship between agriculture and the environment.

5.66. Figures 5.11 and 5.12 are based on the sequence scheme relating agriculture and the environment as depicted in Figure 5.10. They present the FDES components, subcomponents, topics and environment statistics that are considered necessary to inform about this cross-cutting issue. Figure 5.11 presents the key information to describe the relationship between agriculture and the environment down to the topic level. Figure 5.12 presents the individual statistics of the Basic Set of Environment Statistics, organized under the different topics and components of the FDES, in a way that disaggregates the topics of Figure 5.10 to the most detailed level possible. At the end of this analysis of the relationship between agriculture and the environment, several commonly used agri-environmental indicators (AEIs) are presented to illustrate those that can be constructed with the selected environment statistics.

Figure 5.11
Topics in the FDES that relate to agriculture and the environment

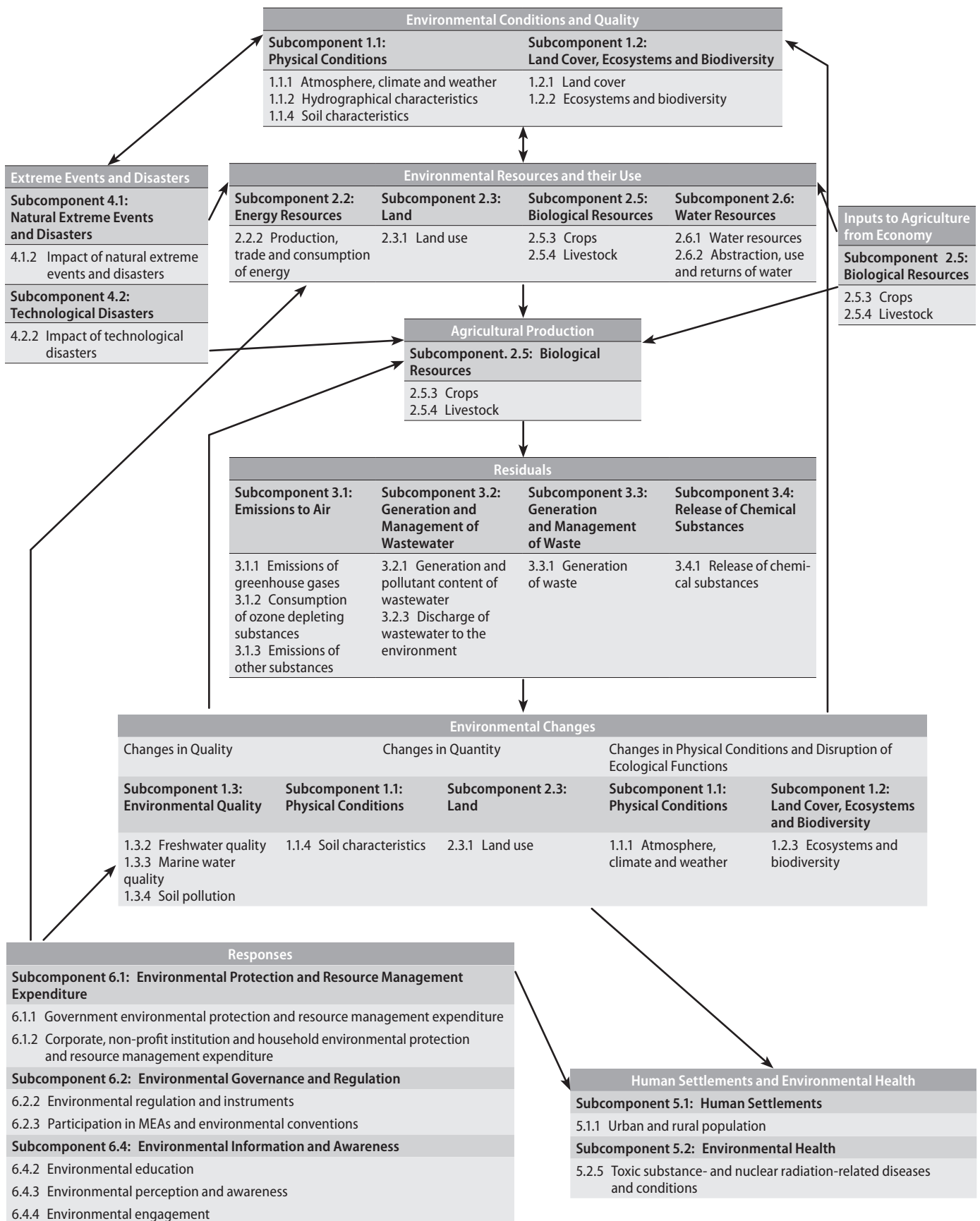


Figure 5.12
Agriculture and the environment, statistics in the Basic Set and Core Set of Environment Statistics

Environmental Conditions and Quality	
Subcomponent 1.1: Physical Conditions	
Topic 1.1.1: Atmosphere, climate and weather	1.1.1.a: Temperature 1.1.1.a.1: Monthly average 1.1.1.a.2: Minimum monthly average 1.1.1.a.3: Maximum monthly average 1.1.1.b: Precipitation (also in 2.6.1.a) 1.1.1.b.1: Annual average 1.1.1.b.2: Long-term annual average 1.1.1.b.3: Monthly average 1.1.1.b.4: Minimum monthly value 1.1.1.b.5: Maximum monthly value 1.1.1.c: Relative humidity 1.1.1.c.1: Minimum monthly value 1.1.1.c.2: Maximum monthly value 1.1.1.f: Solar radiation <i>1.1.1.f.1: Average daily value</i> <i>1.1.1.f.2: Average monthly value</i> <i>1.1.1.f.3: Number of hours of sunshine</i>
Topic 1.1.2: Hydrographical characteristics	1.1.2.a: Lakes 1.1.2.a.1: Surface area <i>1.1.2.a.2: Maximum depth</i> 1.1.2.b: Rivers and streams 1.1.2.b.1: Length 1.1.2.c: Artificial reservoirs <i>1.1.2.c.1: Surface area</i> <i>1.1.2.c.2: Maximum depth</i> 1.1.2.d: Watersheds 1.1.2.d.1: Description of main watersheds 1.1.2.f: <i>Aquifers</i>
Topic 1.1.4: Soil characteristics	1.1.4.a: Soil characterization 1.1.4.a.1: Area of soil types 1.1.4.b: Soil degradation 1.1.4.b.1: Area affected by soil erosion 1.1.4.b.2: Area affected by desertification 1.1.4.b.3: Area affected by salinization 1.1.4.b.4: Area affected by waterlogging 1.1.4.b.5: Area affected by acidification <i>1.1.4.b.6: Area affected by compaction</i> 1.1.4.c: Nutrient content of soil, measured in levels of: 1.1.4.c.1: Nitrogen (N) 1.1.4.c.2: Phosphorous (P) <i>1.1.4.c.3: Calcium (Ca)</i> <i>1.1.4.c.4: Magnesium (Mg)</i> <i>1.1.4.c.5: Potassium (K)</i> <i>1.1.4.c.6: Zinc (Zn)</i>
Subcomponent 1.2: Land Cover, Ecosystems and Biodiversity	
Topic 1.2.1: Land cover	1.2.1.a.: Area under land cover categories
Topic 1.2.2: Ecosystems and biodiversity	1.2.2.a: General ecosystem characteristics, extent and pattern 1.2.2.a.1: Area of ecosystems <i>1.2.2.a.2: Proximity of ecosystem to urban areas and cropland</i>

Environmental Resource Use	
Subcomponent 2.2: Energy Resources	
Topic 2.2.2: Production, trade and consumption of energy	2.2.2.c: Final consumption of energy [for agriculture]
Subcomponent 2.3: Land	
Topic 2.3.1: Land use	2.3.1.a: Area under land use categories 2.3.1.b: Other aspects of land use 2.3.1.b.1: <i>Area of land under organic farming</i> 2.3.1.b.2: Area of land under irrigation 2.3.1.b.4: <i>Area of land under agroforestry</i> 2.3.1.c: Land ownership
Subcomponent 2.5: Biological Resources	
Topic 2.5.3: Crops	2.5.3.a: Main annual and perennial crops 2.5.3.a.1: Area planted 2.5.3.a.2: Area harvested 2.5.3.a.3: Amount produced 2.5.3.a.4: <i>Amount of organic production</i> 2.5.3.a.5: <i>Amount of genetically modified crops produced</i> 2.5.3.b: Amount used of: 2.5.3.b.1: Natural fertilizers (e.g., manure, compost, lime) (also in 3.4.1.a) 2.5.3.b.2: Chemical fertilizers (also in 3.4.1.a) 2.5.3.b.3: Pesticides (also in 3.4.1.b) 2.5.3.b.4: Genetically modified seeds 2.5.3.c: Monoculture/resource-intensive farming systems 2.5.3.c.1: Area being used for production 2.5.3.c.2: Amount produced 2.5.3.c.3: <i>Amount of genetically modified crops produced</i> 2.5.3.d: Imports of crops 2.5.3.e: Exports of crops
Topic 2.5.4: Livestock	2.5.4.a: Livestock 2.5.4.a.1: Number of live animals 2.5.4.a.2: Number of animals slaughtered 2.5.4.b: Amount used of: 2.5.4.b.1: <i>Antibiotics</i> (also in 3.4.1.f) 2.5.4.b.2: <i>Hormones</i> (also in 3.4.1.d) 2.5.4.c: Imports of livestock 2.5.4.d: Exports of livestock
Subcomponent 2.6: Water Resources	
Topic 2.6.1: Water resources	2.6.1.a: Inflow of water to inland water resources 2.6.1.a.1: Precipitation (also in 1.1.1.b) 2.6.1.b: Outflow of water from inland water resources 2.6.1.b.1: Evapotranspiration 2.6.1.c: Inland water stocks 2.6.1.c.1: Surface water stocks in artificial reservoirs 2.6.1.c.2: Surface water stocks in lakes 2.6.1.c.3: <i>Surface water stocks in rivers and streams</i> 2.6.1.c.4: <i>Surface water stocks in wetlands</i> 2.6.1.c.5: <i>Surface water stocks in snow, ice and glaciers</i> 2.6.1.c.6: Groundwater stocks
Topic 2.6.2: Abstraction, use and returns of water	2.6.2.a: Total water abstraction [for agriculture] 2.6.2.b: Water abstraction from surface water [for agriculture] 2.6.2.c: Water abstraction from groundwater [for agriculture] 2.6.2.c.1: From renewable groundwater resources 2.6.2.c.2: From non-renewable groundwater resources 2.6.2.d: Water abstracted for own use [for agriculture] 2.6.2.e: Water abstracted for distribution [for agriculture] 2.6.2.f: Desalinated water [for agriculture] 2.6.2.g: Reused water [for agriculture] 2.6.2.h: Water use [for agriculture] 2.6.2.i: <i>Rainwater collection</i> [for agriculture] 2.6.2.j: <i>Water abstraction from the sea</i> [for agriculture] 2.6.2.k: Losses during transport [for agriculture] 2.6.2.l: <i>Exports of water</i> [for agriculture] 2.6.2.m: <i>Imports of water</i> [for agriculture] 2.6.2.n: <i>Returns of water</i> [for agriculture]

Inputs to Agriculture from Economy	
Subcomponent 2.5: Biological Resources	
Topic 2.5.3: Crops	2.5.3.b: Amount used of: 2.5.3.b.1: Natural fertilizers (e.g. manure, compost, lime) (also in 3.4.1.a) 2.5.3.b.2: Chemical fertilizers (also in 3.4.1.a) 2.5.3.b.3: Pesticides (also in 3.4.1.b) 2.5.3.b.4: Genetically modified seeds
Topic 2.5.4: Livestock	2.5.4.b: Amount used of: 2.5.4.b.1: <i>Antibiotics</i> (also in 3.4.1.f) 2.5.4.b.2: <i>Hormones</i> (also in 3.4.1.d)
Agricultural Production	
Subcomponent 2.5: Biological Resources	
Topic 2.5.3: Crops	2.5.3.a: Main annual and perennial crops 2.5.3.a.1: Area harvested 2.5.3.a.2: Area planted 2.5.3.a.3: Amount produced 2.5.3.a.4: <i>Amount of organic production</i> 2.5.3.a.5: <i>Amount of genetically modified crops produced</i> 2.5.3.c: Monoculture/resource-intensive farming systems: 2.5.3.c.1: Area being used for production 2.5.3.c.2: Amount produced 2.5.3.c.3: <i>Amount of genetically modified crops produced</i>
Topic 2.5.4: Livestock	2.5.4.a: Livestock 2.5.4.a.1: Number of live animals 2.5.4.a.2: Number of animals slaughtered
Residuals	
Subcomponent 3.1: Emissions to Air	
Topic 3.1.1: Emissions of greenhouse gases	3.1.1.a: Total emissions of direct greenhouse gases (GHGs), by gas [from agriculture]: 3.1.1.a.1: Carbon dioxide (CO₂) 3.1.1.a.2: Methane (CH₄)
Topic 3.1.2: Consumption of ozone depleting substances	3.1.2.a: Consumption of ozone depleting substances (ODSs), by substance [by agriculture]: 3.1.2.a.6: Methyl bromide
Topic 3.1.3: Emissions of other substances	3.1.3.a: Emissions of other substances [from agriculture]: 3.1.1.a.1: Particulate matter (PM) 3.1.1.a.2: Heavy metals 3.1.1.a.3: <i>Other</i>
Subcomponent 3.2: Generation and Management of Wastewater	
Topic 3.2.1: Generation and pollutant content of wastewater	3.2.1.a: Volume of wastewater generated [from agriculture] 3.2.1.b: Pollutant content of wastewater [from agriculture]
Topic 3.2.3: Discharge of wastewater to the environment	3.2.3.a: Wastewater discharge [from agriculture] 3.2.3.a.1: Total volume of wastewater discharged to the environment after treatment 3.2.3.a.2: Total volume of wastewater discharged to the environment without treatment 3.2.3.b: Pollutant content of discharged wastewater [from agriculture]
Subcomponent 3.3: Generation and Management of Waste	
Topic 3.3.1: Generation of waste	3.3.1.a: Amount of waste generated by source [by agriculture] 3.3.1.b: Amount of waste generated by waste category [by agriculture] 3.3.1.c: Amount of hazardous waste generated [by agriculture]
Subcomponent 3.4: Release of Chemical Substances	
Topic 3.4.1: Release of chemical substances	3.4.1.a: Total amount of fertilizers used (also in 2.5.1.b and 2.5.3.b) [by agriculture] 3.4.1.b: Total amount of pesticides used (also in 2.5.1.b and 2.5.3.b) [by agriculture] 3.4.1.c: <i>Total amount of pellets used</i> (also in 2.5.2.e) [by agriculture] 3.4.1.d: <i>Total amount of hormones used</i> (also in 2.5.2.e and 2.5.4.b) [by agriculture] 3.4.1.e: <i>Total amount of colourants used</i> (also in 2.5.2.e) [by agriculture] 3.4.1.f: <i>Total amount of antibiotics used</i> (also in 2.5.2.e and 2.5.4.b) [by agriculture]

Environmental Changes	
Changes in Quality	
Subcomponent 1.3: Environmental Quality	
Topic 1.3.2: Freshwater quality	<ul style="list-style-type: none"> 1.3.2.a: Nutrients and chlorophyll <ul style="list-style-type: none"> 1.3.2.a.1: Concentration level of nitrogen 1.3.2.a.2: Concentration level of phosphorous 1.3.2.a.3: Concentration level of chlorophyll A 1.3.2.b: Organic matter <ul style="list-style-type: none"> 1.3.2.b.1: Biochemical oxygen demand (BOD) 1.3.2.b.2: Chemical oxygen demand (COD) 1.3.2.c: Pathogens <ul style="list-style-type: none"> 1.3.2.c.1: Concentration levels of faecal coliforms 1.3.2.d: Metals (e.g., mercury, lead, nickel, arsenic, cadmium) <ul style="list-style-type: none"> 1.3.2.d.1: Concentration levels in sediment and freshwater 1.3.2.d.2: Concentration levels in freshwater organisms 1.3.2.e: Organic contaminants (e.g., PCBs, DDT, pesticides, furans, dioxins, phenols, and radioactive waste) <ul style="list-style-type: none"> 1.3.2.e.1: Concentration levels in sediment and freshwater 1.3.2.e.2: Concentration levels in freshwater organisms 1.3.2.f: Physical and chemical characteristics <ul style="list-style-type: none"> 1.3.2.f.1: pH/acidity/alkalinity 1.3.2.f.2: Temperature <i>1.3.2.f.3: Total suspended solids (TSS)</i> 1.3.2.f.4: Salinity 1.3.2.f.5: Dissolved oxygen (DO)
Topic 1.3.3: Marine water quality	<ul style="list-style-type: none"> 1.3.3.a: Nutrients and chlorophyll <ul style="list-style-type: none"> 1.3.3.a.1: Concentration level of nitrogen 1.3.3.a.2: Concentration level of phosphorous 1.3.3.a.3: Concentration level of chlorophyll A 1.3.3.b: Organic matter <ul style="list-style-type: none"> 1.3.3.b.1: Biochemical oxygen demand (BOD) 1.3.3.b.2: Chemical oxygen demand (COD) 1.3.3.c: Pathogens <ul style="list-style-type: none"> 1.3.3.c.1: Concentration levels of faecal coliforms in recreational marine waters 1.3.3.d: Metals (e.g., mercury, lead, nickel, arsenic, cadmium) <ul style="list-style-type: none"> 1.3.3.d.1: Concentration levels in sediment and marine water 1.3.3.d.2: Concentration levels in marine organisms 1.3.3.e: Organic contaminants (e.g., PCBs, DDT, pesticides, furans, dioxins, phenols, and radioactive waste) <ul style="list-style-type: none"> <i>1.3.3.e.1: Concentration levels in sediment and marine water</i> <i>1.3.3.e.2: Concentration levels in marine organisms</i> 1.3.3.f: Physical and chemical characteristics <ul style="list-style-type: none"> <i>1.3.3.f.1: pH/acidity/alkalinity</i> 1.3.3.f.2: Temperature <i>1.3.3.f.3: Total suspended solids (TSS)</i> <i>1.3.3.f.4: Salinity</i> 1.3.3.f.5: Dissolved oxygen (DO) <i>1.3.3.f.6: Density</i> 1.3.3.g: Coral bleaching <ul style="list-style-type: none"> 1.3.3.g.1: Area affected by coral bleaching 1.3.3.i: Red tide <ul style="list-style-type: none"> <i>1.3.3.i.1: Occurrence</i> <i>1.3.3.i.2: Impacted area</i> <i>1.3.3.i.3: Duration</i>
Topic 1.3.4: Soil pollution	<ul style="list-style-type: none"> 1.3.4.a: Sites affected by pollution <ul style="list-style-type: none"> 1.3.4.a.1: Contaminated sites 1.3.4.a.2: Potentially contaminated sites 1.3.4.a.3: Remediated sites 1.3.4.a.4: Other sites

Changes in Quantity	
Subcomponent 1.1: Physical Conditions	
Topic 1.1.4: Soil characteristics	<p>1.1.4.b: Soil degradation</p> <p>1.1.4.b.1: Area affected by soil erosion</p> <p>1.1.4.b.2: Area affected by desertification</p> <p>1.1.4.b.3: Area affected by salinization</p> <p>1.1.4.b.4: Area affected by waterlogging</p> <p>1.1.4.b.5: Area affected by acidification</p> <p><i>1.1.4.b.6: Area affected by compaction</i></p> <p>1.1.4.c: Nutrient content of soil, measured in levels of:</p> <p>1.1.4.c.1: Nitrogen (N)</p> <p>1.1.4.c.2: Phosphorous (P)</p> <p>1.1.4.c.5: <i>Potassium (K)</i></p>
Subcomponent 2.3: Land	
Topic 2.3.1: Land use	2.3.1.a: Area under land use categories
Changes in Physical Conditions and Disruption of Ecological Functions	
Subcomponent 1.2: Land Cover, Ecosystems and Biodiversity	
Topic 1.2.2: Ecosystems and biodiversity	<p>1.2.2.c: Biodiversity</p> <p>1.2.3.c.1: Known flora and fauna species</p> <p>1.2.3.c.2: Endemic flora and fauna species</p> <p>1.2.3.c.3: Invasive alien flora and fauna species</p> <p>1.2.3.c.4: Species population</p> <p><i>1.2.3.c.5: Habitat fragmentation</i></p>
Human Settlements and Environmental Health	
Subcomponent 5.1: Human Settlements	
Topic 5.1.1: Urban and rural population	<p>5.1.1.b: Population living in rural areas</p> <p>5.1.1.d: Total rural area</p>
Subcomponent 5.2: Environmental Health	
Topic 5.2.5: Toxic substance- and nuclear radiation- related diseases and conditions	<p>5.2.5.a: Toxic substance- and nuclear radiation- related diseases and conditions [agrochemical-related only]</p> <p>5.2.5.a.1: Incidence</p> <p>5.2.5.a.2: Prevalence</p>
Extreme Events and Disasters	
Subcomponent 4.1: Natural Extreme Events and Disasters	
Topic 4.1.2: Impact of natural extreme events and disasters	<p>4.1.2.b: Economic losses due to natural extreme events and disasters (e.g., damage to buildings, transportation networks, loss of revenue for businesses, utility disruption) [adjacent to agriculture]</p> <p>4.1.2.c: Physical losses/damages due to natural extreme events and disasters (e.g., area and amount of crops, livestock, aquaculture, biomass) [adjacent to agriculture]</p> <p>4.1.2.d: Effects of natural extreme events and disasters on integrity of ecosystems</p> <p><i>4.1.2.d.1: Area affected by natural disasters</i> [adjacent to agriculture]</p> <p><i>4.1.2.d.2: Loss of vegetation cover</i> [adjacent to agriculture]</p> <p><i>4.1.2.d.3: Area of watershed affected</i></p> <p><i>4.1.2.d.4: Other</i></p>
Subcomponent 4.2: Technological Disasters	
Topic 4.2.2: Impact of technological disasters	<p>4.2.2.b: Economic losses due to technological disasters (e.g., damage to buildings, transportation networks, loss of revenue for businesses, utility disruption) [adjacent to agriculture]</p> <p>4.2.2.c: Physical losses/damages due to technological disasters (e.g., area and amount of crops, livestock, aquaculture, biomass) [adjacent to agriculture]</p> <p>4.2.2.d: Effects of technological disasters on integrity of ecosystems</p> <p><i>4.2.2.d.1: Area affected by technological disasters</i> [adjacent to agriculture]</p> <p><i>4.2.2.d.2: Loss of vegetation cover</i> [adjacent to agriculture]</p> <p><i>4.2.2.d.3: Area of watershed affected</i></p> <p><i>4.2.2.d.4: Other</i> (e.g., for oil spills: volume of oil released into the environment, impact on ecosystem)</p>

Responses	
Subcomponent 6.1: Environmental Protection and Resource Management Expenditure	
Topic 6.1.1: Government environmental protection and resource management expenditure	6.1.1.a: Government environmental protection and resource management expenditure [only in agriculture] 6.1.1.a.1: Annual government environmental protection expenditure 6.1.1.a.2: Annual government resource management expenditure
Topic 6.1.2: Corporate, non-profit institution and household environmental protection and resource management expenditure	6.1.2.a: Private sector environmental protection and resource management expenditure [only in agriculture] 6.1.2.a.1: Annual corporate environmental protection expenditure 6.1.2.a.2: <i>Annual corporate resource management expenditure</i> 6.1.2.a.3: <i>Annual non-profit institution environmental protection expenditure</i> 6.1.2.a.4: <i>Annual non-profit institution resource management expenditure</i> 6.1.2.a.5: <i>Annual household environmental protection expenditure</i> 6.1.2.a.6: <i>Annual household resource management expenditure</i>
Subcomponent 6.2: Environmental Governance and Regulation	
Topic 6.2.2: Environmental regulation and instruments	6.2.2.a: Direct regulation [related to agriculture] 6.2.2.a.1: List of regulated pollutants and description (e.g., by year of adoption and maximum allowable levels) 6.2.2.a.2: Description (e.g., name, year established) of licensing system to ensure compliance with environmental standards for businesses or other new facilities 6.2.2.a.3: Number of applications for licences received and approved per year 6.2.2.a.4: List of quotas for biological resource extraction 6.2.2.a.5: Budget and number of staff dedicated to enforcement of environmental regulations 6.2.2.b: Economic instruments [related to agriculture] 6.2.2.b.1: <i>List and description</i> (e.g., year of establishment) of <i>green/environmental taxes</i> 6.2.2.b.2: <i>List and description</i> (e.g., year of establishment) of <i>environmentally relevant subsidies</i> 6.2.2.b.3: <i>List of eco-labelling and environmental certification programmes</i> 6.2.2.b.4: Emission permits traded
Topic 6.2.3: Participation in MEAs and environmental conventions	6.2.3.a: Participation in MEAs and other global environmental conventions 6.2.3.a.1: List and description (e.g., country's year of participation ^a) of MEAs and other global environmental conventions [related to agriculture only; desertification and POPs]
Subcomponent 6.4: Environmental Information and Awareness	
Topic 6.4.2: Environmental education	6.4.2.a: Environmental education [related to food/health from agriculture, and/or organic and sustainable agriculture] 6.4.2.a.1: <i>Allocation of resources by central and local authorities for environmental education</i> 6.4.2.a.2: <i>Number and description of environmental education programmes in schools</i> 6.4.2.a.3: <i>Number of students pursuing environment-related higher education</i> (e.g., science, management, education, engineering)
Topic 6.4.3: Environmental perception and awareness	6.4.3.a: Public environmental perception and awareness [related to food/health from agriculture, and/or organic and sustainable agriculture] 6.4.3.a.1: <i>Knowledge and attitudes about environmental issues or concerns</i> 6.4.3.a.2: <i>Knowledge and attitudes about environmental policies</i>
Topic 6.4.4: Environmental engagement	6.4.4.a: Environmental engagement [related to food/health from agriculture, and/or organic and sustainable agriculture] 6.4.4.a.1: Existence of pro-environmental NGOs [number of NGOs and their respective human and financial resources] 6.4.4.a.2: <i>Number of pro-environmental activities</i> 6.4.4.a.3: <i>Number of pro-environmental programmes</i>

^a Participation means that the country or area has become party to the agreements under the treaty or convention, which is achieved through various means, depending on the country's circumstances, namely: accession, acceptance, approval, formal confirmation, ratification and succession. Countries or areas that have signed but not become party to the agreements under a given convention or treaty are not considered to be participating.

Additional indicators commonly used in Agriculture and the Environment

5.67. AEs are indicators able to describe and assess state and trends in the environmental performance of agriculture to furnish useful indications to scientists and policymakers about the state of the environment, about the effects of different policies, as well as about the efficiency in the use of budgets in terms of environmental outcomes.¹¹⁵

5.68. Ideally, AEs are robust, timely, simple and relevant to stakeholders involved in agriculture. The most used indicator framework subdivides AEs into five categories within the Driving force-Pressure-State-Impact-Response (DPSIR) model developed by the European

¹¹⁵ Food and Agriculture Organization of the United Nations (2013), "Agri-Environmental Indicators", available from <http://faostat.fao.org/site/674/default.aspx> (accessed 4 August 2017).

Environment Agency (EEA 1999) and built on the PSR model (OECD 1993). The AEI dataset available within FAOSTAT has been produced in line with the AEI frameworks developed by OECD and EUROSTAT in the last 20 years. Each indicator is described by different data series.

Table 5.1
Agri-Environmental Indicators available within FAOSTAT ¹¹⁶

Domain	Subdomain	Indicator
Air and Climate Change	Ammonia emissions	Ammonia (NH ₃) emissions from agriculture as a percentage of total NH ₃ emissions
Energy	Energy use in agriculture and forestry	Agriculture and forestry energy use as a percentage of total energy use
	Bioenergy production	Bioenergy production as a percentage of total renewable energy production
Fertilizers Consumption	Nitrogen consumption	Nitrogen nutrient use on arable and permanent crop area (N metric tons/1000 ha)
	Phosphate consumption	Phosphate nutrient use on arable and permanent crop area (P ₂ O ₅ metric tons/1000 ha)
	Nitrogen and phosphate	Nitrogen and Phosphate nutrient use on arable and permanent crop area (N+P ₂ O ₅ metric tons/1000 ha)
Land	Agricultural area	Agricultural area as a percentage of land area
	Agricultural area use change	Changes in agricultural area (percentage per year)
	Area equipped for irrigation	Area equipped for irrigation as a percentage of agricultural area
	Conservation agriculture	Conservation agriculture area (>30 per cent group cover) as a percentage of agricultural area
	Cropping patterns	Permanent crops area as a percentage of agricultural area
		Permanent meadows and pastures area as a percentage of agricultural area
	Arable land area as a percentage of agricultural area	
	Organic agricultural area	Organic area as a percentage of agricultural area
Protected land area	Protected terrestrial area as a percentage of land area	
Livestock	Livestock density	Livestock total per hectare of agricultural area (livestock total number/ha)
	Cattle and buffalo	Cattle and buffalo as a percentage of total livestock
	Pigs	Pigs as a percentage of total livestock
	Sheep and goats	Sheep and goats as a percentage of total livestock
	Poultry birds	Poultry birds as a percentage of total livestock
Pesticides	Pesticide use	Pesticide use on arable and permanent crop area (metric tons/1000 ha)
Soil	Soil Erosion—GLASOD	Average soil erosion expressed in GLASOD erosion degree
	Land degradation—GLASOD	Average land degradation expressed in GLASOD erosion degree
	Carbon in topsoil	Average carbon content in the topsoil as a percentage in weight
Water	Water use in agriculture	Water withdrawal for agricultural use as a percentage of total water withdrawal

¹¹⁶ Food and Agriculture Organization of the United Nations (2014), "Agri-Environmental Indicators available within FAOSTAT", available from http://faostat3.fao.org/faostat-gateway/go/to/download/E/*E (accessed 4 August 2017).

Annex A

The Basic Set of Environment Statistics

A.1. The tables containing the complete Basic Set include additional columns which provide further guidance. The fourth column in this table provides illustrations of possible temporal, spatial and subject-based disaggregation of the statistics. These are not mutually exclusive and may overlap. The fifth column refers to existing available methodological guidance from international sources that offer concepts, descriptions, specifications, lists, classifications and statistical methodologies for the given topic of the FDES.

Basic Set Legend

1. The first level in the tables, preceded by a lower-case letter, is the statistics group/category; in some cases where there are no statistics below the first level, this level may also describe a specific statistic.
2. The second level in the tables, preceded by a number, identifies specific statistics.
3. **Bold text is Tier 1 (Core Set) statistics**; regular text is Tier 2 statistics; and *italicized text is Tier 3 statistics*.

Table A.1
The Basic Set of Environment Statistics

Component 1: Environmental Conditions and Quality				
Subcomponent 1.1: Physical Conditions				
Topic	Statistics and related information (Bold text —Core Set/Tier 1; regular text—Tier 2; <i>italicized text</i> —Tier 3)	Category of measurement	Potential aggregations and scales	
			Methodological guidance	
Topic 1.1.1: Atmosphere, climate and weather	a. Temperature		<ul style="list-style-type: none"> • National • Subnational 	
	1. Monthly average	Degrees		
	2. Minimum monthly average	Degrees		
	3. Maximum monthly average	Degrees		
	b. Precipitation (also in 2.6.1.a)			<ul style="list-style-type: none"> • World Meteorological Organization (WMO) • Intergovernmental Panel on Climate Change (IPCC) • National Oceanic and Atmospheric Administration (NOAA)/National Aeronautics and Space Administration (NASA)
	1. Annual average	Height		
	2. Long-term annual average	Height		
	3. Monthly average	Height		
	4. Minimum monthly value	Height		
	5. Maximum monthly value	Height		
	c. Relative humidity			
	1. Minimum monthly value	Number		
	2. Maximum monthly value	Number		
	d. Pressure		<ul style="list-style-type: none"> • National • Subnational • By station 	
	1. <i>Minimum monthly value</i>	Pressure unit		
	2. <i>Maximum monthly value</i>	Pressure unit		
	e. Wind speed			<ul style="list-style-type: none"> • National • Subnational
	1. <i>Minimum monthly value</i>	Speed		
	2. <i>Maximum monthly value</i>	Speed		
	f. Solar radiation		<ul style="list-style-type: none"> • WMO • IPCC • NOAA/NASA 	
	1. <i>Average daily value</i>	Area, energy unit		
	2. <i>Average monthly value</i>	Area, energy unit		
	3. <i>Number of hours of sunshine</i>	Number		
				<ul style="list-style-type: none"> • National • Subnational • By month and per year
	g. UV radiation			
	1. <i>Maximum daily value</i>	Area, energy unit		
	2. <i>Average daily value</i>	Area, energy unit		
	3. <i>Maximum monthly value</i>	Area, energy unit	<ul style="list-style-type: none"> • World Health Organization (WHO)-UV Radiation Index • WMO-UV Radiation 	
	4. <i>Average monthly value</i>	Area, energy unit		
h. Occurrence of El Niño/La Niña events, when relevant				
1. Occurrence	Number	<ul style="list-style-type: none"> • By location • National • Subnational 		
2. Time period	Time period			

Topic 1.1.2: Hydrographical characteristics			<ul style="list-style-type: none"> • United Nations Statistics Division (UNSD): <i>International Recommendations for Water Statistics (IRWS)</i> • UN-Water
a. Lakes			<ul style="list-style-type: none"> • By location • By watershed/river basin • National • Subnational
1. Surface area	Area		
2. <i>Maximum depth</i>	Depth		
b. Rivers and streams			
1. Length	Length		
c. Artificial reservoirs			
1. <i>Surface area</i>	Area		
2. <i>Maximum depth</i>	Depth		
d. Watersheds			
1. Description of main watersheds	Area, description		<ul style="list-style-type: none"> • By location • National, within coastal waters or Exclusive Economic Zone (EEZ)
e. Seas			
1. Coastal waters	Area		
2. Territorial sea	Area		
3. Exclusive Economic Zone (EEZ)	Area		
4. <i>Sea level</i>	Depth		
5. <i>Area of sea ice</i>	Area		
f. <i>Aquifers</i>	Depth, description		<ul style="list-style-type: none"> • By location • By salinity levels • By watershed • National • Subnational • Renewable • Non-renewable
g. Glaciers	Area		<ul style="list-style-type: none"> • By location • National • Subnational
Topic 1.1.3: Geological and geomorphological information			<ul style="list-style-type: none"> • UNSD: <i>Demographic Yearbook</i> • Food and Agriculture Organization of the United Nations (FAO) • Center for International Earth Science Information Network (CIESIN)
a. Geological, geographical and geomorphological conditions of terrestrial areas and islands			<ul style="list-style-type: none"> • National
1. Length of border	Length		
2. Area of country or region	Area, location		
3. Number of islands	Number		<ul style="list-style-type: none"> • By location • National
4. Area of islands	Area		
5. <i>Main geomorphological characteristics of islands</i>	Description		
6. <i>Spatial distribution of land relief</i>	Description, location		
7. <i>Characteristics of landforms</i> (e.g., plains, hills, plateaus, dunes, volcanoes, mountains and seamounts)	Description, area, height		
8. <i>Area by rock types</i>	Area		
9. <i>Length of fault lines</i>	Length		
b. Coastal waters (including area of coral reefs and mangroves)	Area, description		
c. Length of marine coastline	Length		
d. Coastal area	Area		

Table A.1
The Basic Set of Environment Statistics (*continued*)

Topic	Statistics and related information (Bold text —Core Set/Tier 1; regular text—Tier 2; <i>italicized text</i> —Tier 3)	Category of measurement	Potential aggregations and scales	Methodological guidance
Topic 1.1.4: Soil characteristics				
a. Soil characterization				
1. Area by soil types		Area	<ul style="list-style-type: none"> • By location • By soil type • National • Subnational 	<ul style="list-style-type: none"> • FAO and the International Institute for Applied Systems Analysis (IIASA) Harmonized World Soil Database • International Soil Reference and Information Centre (ISRIC) World Data Centre for Soils • United Nations Convention to Combat Desertification (UNCCD) • FAO Global Assessment of Human-induced Soil Degradation (GLASOD)
b. Soil degradation				
1. Area affected by soil erosion		Area		
2. Area affected by desertification		Area		
3. Area affected by salinization		Area		
4. Area affected by waterlogging		Area		
5. Area affected by acidification		Area		
6. <i>Area affected by compaction</i>		Area		
c. Nutrient content of soil, measured in levels of:			<ul style="list-style-type: none"> • By soil type • By nutrient • National • Subnational 	
1. Nitrogen (N)		Concentration		
2. Phosphorous (P)		Concentration		
3. <i>Calcium (Ca)</i>		Concentration		
4. <i>Magnesium (Mg)</i>		Concentration		
5. <i>Potassium (K)</i>		Concentration		
6. <i>Zinc (Zn)</i>		Concentration		
7. <i>Other</i>		Concentration		
Component 1: Environmental Conditions and Quality				
Subcomponent 1.2: Land Cover, Ecosystems and Biodiversity				
Topic 1.2.1: Land cover				
a. Area under land cover categories		Area	<ul style="list-style-type: none"> • By location • By type of land cover (e.g., artificial surfaces including urban and associated areas; herbaceous crops; woody crops; multiple or layered crops; grassland; tree-covered areas; mangroves; shrub-covered areas; shrubs and/or herbaceous vegetation, aquatic or regularly flooded; sparsely natural vegetated areas; terrestrial barren land; permanent snow and glaciers; inland water bodies; and coastal water bodies and inter-tidal areas)^a • National • Subnational 	<ul style="list-style-type: none"> • FAO Land Cover Classification System • System of Environmental-Economic Accounting (SEEA) Central Framework (2012) land cover categories • European Environment Agency (EEA)

Topic 1.2.2: Ecosystems and biodiversity			
a.	General ecosystem characteristics, extent and pattern		
	1. Area of ecosystems	Area	<ul style="list-style-type: none"> • By location • By ecosystem (e.g., forest, cultivated, dryland, coastal, marine, urban, polar, inland water, island, mountain)^b
	2. <i>Proximity of ecosystem to urban areas and cropland</i>	Distance	<ul style="list-style-type: none"> • Millennium Ecosystem Assessment • Convention on Biological Diversity (CBD) • UN Economic Commission for Europe (UNECE) Standard Statistical Classification of Flora, Fauna and Biotopes (1996) • Convention on Wetlands of International Importance, especially as Waterfowl Habitat (the Ramsar Convention)
b.	Ecosystems' chemical and physical characteristics		
	1. <i>Nutrients</i>	Concentration	
	2. <i>Carbon</i>	Concentration	
	3. <i>Pollutants</i>	Concentration	
c.	Biodiversity		
	1. Known flora and fauna species	Number	<ul style="list-style-type: none"> • By ecosystem (e.g., forest, cultivated, dryland, coastal, marine, urban, polar, inland water, island, mountain)^b • By status category (e.g., extinct, extinct in the wild, threatened, near threatened, least concern) • By class (e.g., mammals, fishes, birds and reptiles) • National • Subnational
	2. Endemic flora and fauna species	Number	<ul style="list-style-type: none"> • International Union for Conservation of Nature (IUCN) Red List of Threatened Species
	3. Invasive alien flora and fauna species	Number	<ul style="list-style-type: none"> • UNECE Standard Statistical Classification of Flora, Fauna and Biotopes (1996) • FAO FISHSSTAT (Species population and number of invasive alien species)
	4. Species population	Number	
	5. <i>Habitat fragmentation</i>	Area, description, location, number	
d.	Protected areas and species		
	1. Protected terrestrial and marine area (also in 1.2.3.a)	Number, area	<ul style="list-style-type: none"> • IUCN Protected Area Management Categories • UNSD: Millennium Development Goal (MDG) Indicator 7.6 Metadata
	2. Protected flora and fauna species	Number	<ul style="list-style-type: none"> • IUCN Red List of Threatened Species • UNSD: MDG Indicator 7.7 Metadata
			<ul style="list-style-type: none"> • By species • By ecosystem (e.g., forest, cultivated, dryland, coastal, marine, urban, polar, inland water, island, mountain)^b • By status category • National • Subnational

^a SEEA land cover categories, based on FAO Land Cover Classification System (http://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf)

^b Reporting categories used in the Millennium Ecosystem Assessment (www.millenniumassessment.org/documents/document.356.aspx.pdf)

^c IUCN reporting categories: strict nature reserves; wilderness areas; national parks; natural monuments or features; habitat/species management areas; protected landscapes/seascapes; and protected areas with sustainable use of natural resources (www.iucn.org/about/work/programmes/gpap_home/gpap_quality/gpap_pacategories/)

Table A.1
The Basic Set of Environment Statistics (continued)

Topic	Statistics and related information (Bold text —Core Set/Tier 1; regular text—Tier 2; <i>italicized text</i> —Tier 3)	Category of measurement	Potential aggregations and scales	Methodological guidance	
Topic 1.2.3: Forests	a. Forest area		<ul style="list-style-type: none"> By forest type National Subnational By dominant tree species By ownership category 	<ul style="list-style-type: none"> FAO Global Forest Resources Assessment (FRA) UN Forum on Forests (UNFF) Monitoring, Assessment and Reporting (MAR) UNSD: MDG Indicator 7.1 Metadata Montreal Process (Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests) State of Europe's Forests (Forest Europe/ UNECE-FAO Forestry and Timber Section) 	
	1. Total	Area			
	2. Natural	Area			
	3. Planted	Area			
	4. Protected forest area (also in 1.2.2.d)	Area			
	5. Forest area affected by fire	Area			
	b. Forest biomass		Volume		
	1. Total		Mass		
	2. <i>Carbon storage in living forest biomass</i>				
	Component 1: Environmental Conditions and Quality				
Subcomponent 1.3: Environmental Quality					
Topic 1.3.1: Air quality	a. Local air quality		<ul style="list-style-type: none"> By point measurement Subnational Daily maximum Monthly maximum and average Yearly maximum and average 	<ul style="list-style-type: none"> WHO Air Quality Guidelines—Global Update 2005, Particulate matter, ozone, nitrogen dioxide and sulfur dioxide WHO Air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide, Global Update 2005, Summary of risk assessment UNECE Standard Statistical Classification of Ambient Air Quality (1990) 	
	1. Concentration level of particulate matter (PM₁₀)	Concentration			
	2. Concentration level of particulate matter (PM_{2.5})	Concentration			
	3. Concentration level of tropospheric ozone (O₃)	Concentration			
	4. Concentration level of carbon monoxide (CO)	Concentration			
	5. Concentration level of sulphur dioxide (SO₂)	Concentration			
	6. Concentration levels of nitrogen oxides (NO_x)	Concentration			
	7. Concentration levels of heavy metals	Concentration			
	8. Concentration levels of non-methane volatile organic compounds (NMVOCs)	Concentration			
	9. <i>Concentration levels of dioxins</i>	Concentration			
	10. <i>Concentration levels of furans</i>	Concentration			
	11. Concentration levels of other pollutants	Concentration			
12. Number of days when maximum allowable levels were exceeded per year	Number		<ul style="list-style-type: none"> By pollutant 		
b. Global atmospheric concentrations of greenhouse gases			<ul style="list-style-type: none"> Global 	WMO	
1. Global atmospheric concentration level of carbon dioxide (CO ₂)	Concentration				
2. Global atmospheric concentration level of methane (CH ₄)	Concentration				

Topic 1.3.2: Freshwater quality			
a.	Nutrients and chlorophyll		
	1. Concentration level of nitrogen	Concentration	<ul style="list-style-type: none"> • By water body • By watershed/river basin • By surface or groundwater • By point measurement • By type of water resource
	2. Concentration level of phosphorus	Concentration	<ul style="list-style-type: none"> • UNECE Standard Statistical Classification of Freshwater Quality for the Maintenance of Aquatic Life (1992) • UN Environment Programme (UNEP) Global Environment Monitoring System—Water (GEMS-Water) • WHO
	3. Concentration level of chlorophyll A	Concentration	
b.	Organic matter		
	1. Biochemical oxygen demand (BOD)	Concentration	
	2. Chemical oxygen demand (COD)	Concentration	
c.	Pathogens		
	1. Concentration levels of faecal coliforms	Concentration	
	d. Metals (e.g., mercury, lead, nickel, arsenic, cadmium)		
	1. Concentration levels in sediment and freshwater	Concentration	
	2. Concentration levels in freshwater organisms	Concentration	
e.	Organic contaminants (e.g., PCBs, DDT, pesticides, furans, dioxins, phenols, and radioactive waste)		
	1. Concentration levels in sediment and freshwater	Concentration	<ul style="list-style-type: none"> • UNECE Standard Statistical Classification of Freshwater Quality for the Maintenance of Aquatic Life (1992) • UNEP GEMS-Water • Stockholm Convention
	2. Concentration levels in freshwater organisms	Concentration	
f.	Physical and chemical characteristics		
	1. pH/acidity/alkalinity	Level	<ul style="list-style-type: none"> • UNECE Standard Statistical Classification of Freshwater Quality for the Maintenance of Aquatic Life (1992) • UNEP GEMS-Water
	2. Temperature	Degrees	
	3. <i>Total suspended solids (TSS)</i>	Concentration	
	4. Salinity	Concentration	
	5. Dissolved oxygen (DO)	Concentration	
g.	Plastic waste and other freshwater debris		
	1. Amount of plastic waste and other debris	Area, mass	

Table A.1
The Basic Set of Environment Statistics (*continued*)

Topic	Statistics and related information (Bold text —Core Set/Tier 1; regular text—Tier 2; <i>italicized text</i> —Tier 3)	Category of measurement	Potential aggregations and scales	Methodological guidance
Topic 1.3.3: Marine water quality	a. Nutrients and chlorophyll			
	1. Concentration level of nitrogen	Concentration	• By coastal zone, delta, estuary or other local marine environment	• UNECE Standard Statistical Classification of Marine Water Quality (1992)
	2. Concentration level of phosphorous	Concentration	• Subnational	• NOAA/NASA
	3. Concentration level of chlorophyll A	Concentration	• National	• UNEP Regional Seas Programme
	b. Organic matter		• Supranational	
	1. Biochemical oxygen demand (BOD)	Concentration	• By point measurement	
	2. Chemical oxygen demand (COD)	Concentration	• By water resource	
	c. Pathogens			
	1. Concentration levels of faecal coliforms in recreational marine waters	Concentration		
	d. Metals (e.g., mercury, lead, nickel, arsenic, cadmium)			
	1. Concentration levels in sediment and marine water	Concentration		
	2. Concentration levels in marine organisms	Concentration		
	e. Organic contaminants (e.g., PCBs, DDT, pesticides, furans, dioxins, phenols, and radioactive waste)			
	1. <i>Concentration levels in sediment and marine water</i>	Concentration		• UNECE Standard Statistical Classification of Marine Water Quality (1992)
	2. <i>Concentration levels in marine organisms</i>	Concentration		• NOAA/NASA
				• UNEP Regional Seas Programme
				• Stockholm Convention
	f. Physical and chemical characteristics			• UNECE Standard Statistical Classification of Marine Water Quality (1992)
	1. <i>pH/acidity/alkalinity</i>	Level		• NOAA/NASA
	2. Temperature	Degrees		• UNEP Regional Seas Programme
3. <i>Total suspended solids (TSS)</i>	Concentration		• Stockholm Convention	
4. <i>Salinity</i>	Concentration			
5. Dissolved oxygen (DO)	Concentration			
6. <i>Density</i>	Density			
9. Coral bleaching				
1. Area affected by coral bleaching	Area			
h. Plastic waste and other marine debris				
1. <i>Amount of plastic waste and other debris in marine waters</i>	Area, mass		• By coastal zone, delta, estuary or other local marine environment	
i. Red tide			• By location	
1. <i>Occurrence</i>	Number		• Subnational	
2. <i>Impacted area</i>	Area		• National	
3. <i>Duration</i>	Duration		• Supranational	
j. Oil pollution			• By point measurement	
1. <i>Area of oil slicks</i>	Area			
2. <i>Amount of tar balls</i>	Area, diameter, number			

Topic 1.3.4: Soil pollution		
a. Sites affected by pollution		<ul style="list-style-type: none"> • By location • Subnational
1. Contaminated sites	Area, number	
2. Potentially contaminated sites	Area, number	<ul style="list-style-type: none"> • By type of pollutant • By source
3. Remediated sites	Area, number	
4. Other sites	Area, number	
Topic 1.3.5: Noise		
a. Levels of noise from specific sources	Level	<ul style="list-style-type: none"> • WHO
b. Levels of noise in specific locations	Level	<ul style="list-style-type: none"> • By source • By location • Subnational
Component 2: Environmental Resources and their Use		
Subcomponent 2.1: Mineral Resources		
Topic 2.1.1: Stocks and changes of mineral resources		
a. Mineral resources		<ul style="list-style-type: none"> • United Nations Framework Classification for Energy and Mineral Resources (UNFC 2009) • SEEA Central Framework (2012) asset and physical flow accounts • International Standard Industrial Classification of All Economic Activities (ISIC) Rev. 4, Section B, Divisions 05–09
1. Stocks of commercially recoverable resources	Mass, volume	
2. New discoveries	Mass, volume	<ul style="list-style-type: none"> • By mineral (e.g., metal ores including precious metals and rare earths, coal, oil, gas, stone, sand and clay, chemical and fertilizer minerals, salt, gemstones, abrasive minerals, graphite, asphalt, natural solid bitumen, quartz, mica)
3. Upward reappraisals	Mass, volume	<ul style="list-style-type: none"> • National • Subnational
4. Upward reclassifications	Mass, volume	
5. Extraction	Mass, volume	
6. Catastrophic losses	Mass, volume	
7. Downward reappraisals	Mass, volume	
8. Downward reclassifications	Mass, volume	
9. Stocks of potentially commercially recoverable resources	Mass, volume	
10. Stocks of non-commercial and other known resources	Mass, volume	
Topic 2.1.2: Production and trade of minerals		
a. Production of minerals	Mass, volume	<ul style="list-style-type: none"> • Harmonized Commodity Description and Coding Systems (HS) 2012, Section V, Chapters 25 and 26, and Section VI Chapter 28
b. Imports of minerals	Currency, mass, volume	
c. Exports of minerals	Currency, mass, volume	
Subcomponent 2.2: Energy Resources		
Topic 2.2.1: Stocks and changes of energy resources		
a. Energy resources		<ul style="list-style-type: none"> • UNSD: International Recommendations for Energy Statistics (IRES) • International Energy Agency (IEA) Energy Statistics Manual • SEEA Central Framework (2012) asset and physical flow accounts • UNFC 2009 • ISIC Rev. 4, Section B, Divisions 05–09 • HS 2012, Section V, Chapter 27
1. Stocks of commercially recoverable resources	Mass, volume	<ul style="list-style-type: none"> • By resource (e.g., natural gas, crude oil and natural gas liquids, oil shale, and extra heavy oil (includes oil extracted from oil sands), coal and lignite, peat, non-metallic minerals except for coal or peat, uranium and thorium ores)
2. New discoveries	Mass, volume	<ul style="list-style-type: none"> • National • Subnational
3. Upward reappraisals	Mass, volume	
4. Upward reclassifications	Mass, volume	
5. Extraction	Mass, volume	
6. Catastrophic losses	Mass, volume	
7. Downward reappraisals	Mass, volume	
8. Downward reclassifications	Mass, volume	
9. Stocks of potentially commercially recoverable resources	Mass, volume	
10. Stocks of non-commercial and other known resources	Mass, volume	

Table A.1
The Basic Set of Environment Statistics (continued)

Topic	Statistics and related information (Bold text —Core Set/Tier 1; regular text—Tier 2; <i>italicized text</i> —Tier 3)	Category of measurement	Potential aggregations and scales	Methodological guidance
Topic 2.2.2: Production, trade and consumption of energy				
a. Production of energy				
1. Total production	Energy unit, mass, volume		<ul style="list-style-type: none"> By non-renewable resource (e.g., petroleum, natural gas, coal, nuclear fuels, non-sustainable firewood, waste, other non-renewables) 	<ul style="list-style-type: none"> UNSD: IRES IEA Energy Statistics Manual
2. Production from non-renewable sources	Energy unit, mass, volume		<ul style="list-style-type: none"> By renewable resource (e.g., solar, hydroelectric, geothermal, tidal action, wave action, marine, wind and biomass) 	<ul style="list-style-type: none"> Joint Wood Energy Enquiry (UNECE-FAO Forestry and Timber Section)
3. Production from renewable sources	Energy unit, mass, volume		<ul style="list-style-type: none"> National Subnational 	
4. Primary energy production	Energy unit, mass, volume		<ul style="list-style-type: none"> By primary energy resource (e.g., petroleum, natural gas, coal, hydroenergy, geothermal, nuclear fuels, cane products, other primary) 	
5. Imports of energy	Energy unit, mass, volume		<ul style="list-style-type: none"> By secondary energy product (e.g., electricity, liquefied petroleum gas, gasoline/alcohol, kerosene, diesel oil, fuel oil, coke, charcoal, gases, other secondary) 	
6. Exports of energy	Energy unit, mass, volume		<ul style="list-style-type: none"> National Subnational 	
7. Secondary energy production	Energy unit, mass, volume		<ul style="list-style-type: none"> National Subnational 	
b. Total energy supply	Energy unit, mass, volume		<ul style="list-style-type: none"> By energy product 	
c. Final consumption of energy	Energy unit, mass, volume		<ul style="list-style-type: none"> By households By ISIC economic activity By tourists National Subnational 	
Subcomponent 2.3: Land				
Topic 2.3.1: Land use				
a. Area under land use categories	Area		<ul style="list-style-type: none"> By type of land use (e.g., agriculture; forestry; land used for aquaculture; use of built-up and related areas; land used for maintenance and restoration of environmental functions; other uses of land not elsewhere classified; land not in use; inland waters used for aquaculture or holding facilities; inland waters used for maintenance and restoration of environmental functions; other uses of inland waters not elsewhere classified; inland water not in use; coastal waters (including coral reefs and mangroves); Exclusive Economic Zone (EEZ)) National Subnational 	<ul style="list-style-type: none"> FAO UNECE Standard Classification of Land Use (1989) SEEA Central Framework (2012) Annex 1
b. Other aspects of land use				
1. <i>Area of land under organic farming</i>	Area		<ul style="list-style-type: none"> National Subnational 	<ul style="list-style-type: none"> FAO Inter-departmental Working Group on Organic Agriculture
2. Area of land under irrigation	Area			
3. Area of land under sustainable forest management	Area			<ul style="list-style-type: none"> Forest Stewardship Council
4. <i>Area of land under agroforestry</i>	Area			
c. Land ownership	Area		<ul style="list-style-type: none"> By ownership category National Subnational 	<ul style="list-style-type: none"> FAO

Topic 2.3.2: Use of forest land				<ul style="list-style-type: none"> • By forest type • National • Subnational • By dominant tree species 	<ul style="list-style-type: none"> • FAO FRA • UNFF MAR • UNSD: MDG Indicator 7.1 Metadata • Montreal Process (Working Group on Criteria and Indicators for the Conservation and Sustainable Management of Temperate and Boreal Forests) • State of Europe's Forests (Forest Europe/ UNECE-FAO Forestry and Timber Section)
a.	Use of forest land				
	1. Area deforested	Area			
	2. Area reforested	Area			
	3. Area afforested	Area			
	4. <i>Natural growth</i>	Area			
b.	Forest area by primary designated function	Area		<ul style="list-style-type: none"> • Production • Protection of soil and water • Conservation of biodiversity • Social services • Multiple use • Other 	<ul style="list-style-type: none"> • FAO FRA
Subcomponent 2.4: Soil Resources					
Topic 2.4.1: Soil resources					
Further research is needed to develop the necessary statistics in this topic.					
Subcomponent 2.5: Biological Resources					
Topic 2.5.1: Timber resources					
a.	Timber resources			<ul style="list-style-type: none"> • By type (e.g., natural or planted) • National • Subnational 	<ul style="list-style-type: none"> • SEEA Central Framework (2012) • FAO FRA • State of Europe's Forests (Forest Europe/ UNECE-FAO Forestry and Timber Section) • UNECE/FAO Joint Working Party on Forest Statistics, Economics and Management • ISIC Rev. 4, Section A, Division 02 • FAOSTAT database
	1. Stocks of timber resources	Volume			
	2. Natural growth	Volume			
	3. Fellings	Volume			
	4. Removals	Volume			
	5. <i>Felling residues</i>	Volume			
	6. <i>Natural losses</i>	Volume			
	7. <i>Catastrophic losses</i>	Volume			
	8. <i>Reclassifications</i>	Volume			
b.	Amount used of:			<ul style="list-style-type: none"> • National • Subnational 	
	1. Fertilizers (also in 3.4.1.a)	Area, mass, volume			
	2. Pesticides (also in 3.4.1.b)	Area, mass, volume			
c.	Forest production	Volume		<ul style="list-style-type: none"> • By type of product (e.g., timber, industrial round-wood, fuelwood, pulp, chips) • National • Subnational 	<ul style="list-style-type: none"> • Central Product Classification (CPC) • Joint Forest Sector Questionnaire (UNECE/FAO/Eurostat International Tropical Timber Organization (ITTO)) • FAO/ITTO/UNECE/Eurostat Inter-secretariat Working Group on Forest Sector Statistics • UNECE Timber Committee • UNECE/FAO Joint Working Party on Forest Statistics, Economics and Management • ISIC Rev. 4, Section A, Division 02 • FAOSTAT database
d.	Fuelwood production	Volume		<ul style="list-style-type: none"> • National 	<ul style="list-style-type: none"> • FAO/ITTO/UNECE/Eurostat Inter-secretariat Working Group on Forest Sector Statistics
e.	Imports of forest products	Currency, mass, volume		<ul style="list-style-type: none"> • By type of product 	<ul style="list-style-type: none"> • State of Europe's Forests (Forest Europe/ UNECE-FAO Forestry and Timber Section) • HS 2012, Sections IX and X • FAOSTAT database
f.	Exports of forest products	Currency, mass, volume			

Table A.1
The Basic Set of Environment Statistics (*continued*)

Topic	Statistics and related information (Bold text —Core Set/Tier 1; regular text—Tier 2; <i>italicized text</i> —Tier 3)	Category of measurement	Potential aggregations and scales	Methodological guidance	
Topic 2.5.2: Aquatic resources	a. Fish capture production	Mass	• By relevant freshwater and marine species	• FAO International Standard Statistical Classification for Aquatic Animals and Plants (ISSCAAP)	
	b. Aquaculture production	Mass	• National • Subnational	• ISIC Rev. 4, Section A, Division 03	
	c. Imports of fish and fishery products	Currency, mass, volume	• By relevant freshwater and marine species	• The United Nations Convention on the Law of the Sea (UNCLOS)	
	d. Exports of fish and fishery products	Currency, mass, volume	• By type of product • By species	• UNSD: MDG Indicator 7.4 Metadata	
	e. Amount used of:		• By type of water (i.e., marine or freshwater)	• HS 2012, Section I, Chapter 03	
	1. <i>Pellets</i> (also in 3.4.1.c)	Mass, volume	• National • Subnational	• SEEA Central Framework (2012)	
	2. <i>Hormones</i> (also in 3.4.1.d)	Mass, volume			
	3. <i>Colourants</i> (also in 3.4.1.e)	Mass, volume			
	4. <i>Antibiotics</i> (also in 3.4.1.f)	Mass, volume			
	5. <i>Fungicides</i>	Mass, volume			
	f. Aquatic resources		• By relevant freshwater and marine species		
	1. Stocks of aquatic resources	Mass	• By type (e.g., natural or cultivated)		
	2. <i>Additions to aquatic resources</i>	Mass	• National		
	3. <i>Reductions in aquatic resources</i>	Mass	• Subnational		
	Topic 2.5.3: Crops	a. Main annual and perennial crops		• By crop	• FAO Indicative Crop Classification (for 2010 round of agricultural censuses)
		1. Area harvested	Area	• By size	• FAO/WHO Specifications for Pesticides (2010)
2. Area planted		Area	• National	• FAO Specifications for Commonly Used Fertilizers (2009)	
3. Amount produced		Mass	• Subnational	• ISIC Rev. 4, Section A, Division 1	
4. <i>Amount of organic production</i>		Mass		• FAOSTAT database	
5. <i>Amount of genetically modified crops produced</i>		Mass		• HS 2012, Section II	
b. Amount used of:			• By type of fertilizer		
1. Natural fertilizers (e.g., manure, compost, lime) (also in 3.4.1.a)		Area, mass, volume	• By type of pesticide		
2. Chemical fertilizers (also in 3.4.1.a)		Area, mass, volume	• By crop		
3. Pesticides (also in 3.4.1.b)		Area, mass, volume	• National • Subnational		
4. Genetically modified seeds		Mass	• By crop • National • Subnational		
c. Monoculture/resource-intensive farming systems			• By crop		
1. Area being used for production		Area	• By size		
2. Amount produced		Mass	• National		
3. <i>Amount of genetically modified crops produced</i>		Mass	• Subnational		
d. Imports of crops		Currency, mass			
e. Exports of crops	Currency, mass				

Topic 2.5.4: Livestock				<ul style="list-style-type: none"> • FAOSTAT database • ISIC Rev. 4, Section A, Division 01 • HS 2012, Section I, Chapter 01
a. Livestock				<ul style="list-style-type: none"> • By type of animal • National • Subnational
1. Number of live animals	Number			
2. Number of animals slaughtered	Number			
b. Amount used of:				
1. Antibiotics (also in 3.4.1.f)	Mass			
2. Hormones (also in 3.4.1.d)	Mass			
c. Imports of livestock	Currency, number			
d. Exports of livestock	Currency, number			
a. Permits for regulated hunting and trapping of wild animals				<ul style="list-style-type: none"> • ISIC Rev. 4, Section A, Class 0170
1. Number of permits issued per year	Number			<ul style="list-style-type: none"> • By species
2. Number of animal kills allowed by permits	Number			
b. Imports of endangered species	Currency, number			<ul style="list-style-type: none"> • Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
c. Exports of endangered species	Currency, number			<ul style="list-style-type: none"> • ISIC Rev. 4, Section A, Class 0170 • CITES
d. Reported wild animals killed or trapped for food or sale	Number			
e. Trade in wildlife and captive-bred species	Description, mass, number			<ul style="list-style-type: none"> • By status category • National • Subnational
f. Non-wood forest products and other plants	Mass, volume			<ul style="list-style-type: none"> • ISIC Rev. 4, Section A, Class 0230
Component 2: Environmental Resources and their Use				
Subcomponent 2.6: Water Resources				
Topic 2.6.1: Water resources				
a. Inflow of water to inland water resources				<ul style="list-style-type: none"> • National • Subnational
1. Precipitation (also in 1.1.1.b)	Volume			<ul style="list-style-type: none"> • UNCE Standard Statistical Classification of Water Use (1989)
2. Inflow from neighbouring territories	Volume			<ul style="list-style-type: none"> • By territory of origin and destination
3. Inflow subject to treaties	Volume			
b. Outflow of water from inland water resources				<ul style="list-style-type: none"> • UNSD: MDG Indicator 7.5 Metadata • FAO AQUASTAT • SEEA Central Framework (2012) asset accounts • SEEA Water • UNSD: Environment Statistics Section—Water Questionnaire
1. Evapotranspiration	Volume			
2. Outflow to neighbouring territories	Volume			
3. Outflow subject to treaties	Volume			
4. Outflow to the sea	Volume			
c. Inland water stocks				<ul style="list-style-type: none"> • National • Subnational
1. Surface water stocks in artificial reservoirs	Volume			
2. Surface water stocks in lakes	Volume			
3. Surface water stocks in rivers and streams	Volume			
4. Surface water stocks in wetlands	Volume			
5. Surface water stocks in snow, ice and glaciers	Volume			
6. Groundwater stocks	Volume			

Table A.1
The Basic Set of Environment Statistics (*continued*)

Topic	Statistics and related information (Bold text —Core Set/Tier 1; regular text—Tier 2; <i>italicized text</i> —Tier 3)	Category of measurement	Potential aggregations and scales	Methodological guidance
Topic 2.6.2: Abstraction, use and returns of water				
a. Total water abstraction	Volume	• By type of source	• UNSD: IRWS	
b. Water abstraction from surface water	Volume	• National	• UNECE Standard Statistical Classification of Water Use (1989)	
c. Water abstraction from groundwater		• Subnational	• FAO AQUASTAT	
1. From renewable groundwater resources	Volume		• SEEA Central Framework (2012)	
2. From non-renewable groundwater resources	Volume		• SEEA Water	
d. Water abstracted for own use	Volume	• By ISIC economic activity	• UNSD: Environment Statistics Section— Water Questionnaire	
e. Water abstracted for distribution	Volume	• National		
		• Subnational		
f. Desalinated water	Volume	• National		
g. Reused water	Volume	• Subnational		
h. Water use	Volume	• By ISIC economic activity		
		• By tourists		
		• National		
		• Subnational		
i. <i>Rainwater collection</i>	Volume	• National		
j. <i>Water abstraction from the sea</i>	Volume	• Subnational		
k. Losses during transport	Volume	• By ISIC economic activity		
		• National		
		• Subnational		
l. <i>Exports of water</i>	Volume	• National		
m. <i>Imports of water</i>	Volume	• Subnational		
n. <i>Returns of water</i>	Volume	• By ISIC economic activity		
		• By destination (e.g., inland water, land, sea, ocean)		
		• National		
		• Subnational		
Component 3: Residuals				
Subcomponent 3.1: Emissions to Air				
Topic 3.1.1: Emissions of green- house gases				
a. Total emissions of direct greenhouse gases (GHGs), by gas:		• By ISIC economic activity	• IPCC Emission Factor Database	
1. Carbon dioxide (CO₂)	Mass	• By tourists	• UN Framework Convention on Climate Change (UNFCCC) Reporting Guidelines	
2. Methane (CH₄)	Mass	• National	• UNECE Standard Statistical Classification of Ambient Air Quality (1990)	
3. Nitrous oxide (N₂O)	Mass	• Subnational	• UNSD: MDG Indicator 7.2 Metadata	
4. Perfluorocarbons (PFCs)	Mass	• By IPCC source categories	• WHO	
5. Hydrofluorocarbons (HFCs)	Mass			
6. Sulphur hexafluoride (SF₆)	Mass			
b. Total emissions of indirect greenhouse gases (GHGs), by gas:				
1. Sulphur dioxide (SO₂)	Mass			
2. Nitrogen oxides (NO_x)	Mass			
3. Non-methane volatile organic compounds (NM-VOCs)	Mass			
4. Other	Mass			

Topic 3.1.2: Consumption of ozone depleting substances			<ul style="list-style-type: none"> • UNEP Ozone Secretariat • IPCC Emission Factor Database • UNECE Standard Statistical Classification of Ambient Air Quality (1990) • UNSD: MDG Indicator 7.3 Metadata • WHO
a. Consumption of ozone depleting substances (ODSs), by substance:			
1. Chlorofluorocarbons (CFCs)	Mass		
2. Hydrochlorofluorocarbons (HCFCs)	Mass		
3. Halons	Mass		
4. Methyl chloroform	Mass		
5. Carbon tetrachloride	Mass		
6. Methyl bromide	Mass		
7. Other	Mass		
Topic 3.1.3: Emissions of other substances			<ul style="list-style-type: none"> • UNECE Standard Statistical Classification of Ambient Air Quality (1990) • European Monitoring and Evaluation Programme (EMEP) under the Convention on Long-range Transboundary Air Pollution
a. Emissions of other substances:			
1. Particulate matter (PM)	Mass		
2. Heavy metals	Mass		
3. Other	Mass		
Subcomponent 3.2: Generation and Management of Wastewater			
Topic 3.2.1: Generation and pollutant content of wastewater			<ul style="list-style-type: none"> • UNSD: IRWS • ISIC Rev. 4, Section E, Divisions 35-37 • SEEA Water • UNSD: Environment Statistics Section—Water Questionnaire
a. Volume of wastewater generated	Volume		<ul style="list-style-type: none"> • By ISIC economic activity • By tourists • National • Subnational
b. Pollutant content of wastewater	Mass		<ul style="list-style-type: none"> • By pollutant or pollution parameter (e.g., biochemical oxygen demand (BOD), chemical oxygen demand (COD), nitrogen, phosphorous, total suspended solids (TSS)) • By ISIC economic activity • National • Subnational
Topic 3.2.2: Collection and treatment of wastewater			<ul style="list-style-type: none"> • UNSD: IRWS • ISIC Rev. 4, Section E, Division 35 and 36 • UNSD: Environment Statistics Section—Water Questionnaire
a. Volume of wastewater collected	Volume		<ul style="list-style-type: none"> • National • Subnational
b. Volume of wastewater treated	Volume		<ul style="list-style-type: none"> • By treatment type (e.g., primary, secondary, tertiary) • National • Subnational
c. Total urban wastewater treatment capacity	Volume		
1. Number of plants	Number		
2. Capacity of plants	Volume		
d. Total industrial wastewater treatment capacity	Volume		
1. Number of plants	Number		
2. Capacity of plants	Volume		
Topic 3.2.3: Discharge of wastewater to the environment			
a. Wastewater discharge			
1. Total volume of wastewater discharged to the environment after treatment	Volume		<ul style="list-style-type: none"> • By treatment type (e.g., primary, secondary, tertiary) • By recipient (e.g., surface water, groundwater, wetland, sea, land) • By ISIC economic activity • National • Subnational • By source (point/non-point source)
2. Total volume of wastewater discharged to the environment without treatment	Volume		
b. Pollutant content of discharged wastewater	Mass		<ul style="list-style-type: none"> • By pollutant or pollution parameter (e.g., BOD, COD, nitrogen, phosphorous) • National • Subnational • Net emission by ISIC economic activity • By source (point/non-point source)

Table A.1
The Basic Set of Environment Statistics (*continued*)

Subcomponent 3.3: Generation and Management of Waste				
Topic	Statistics and related information (Bold text —Core Set/Tier 1; regular text—Tier 2; <i>italicized text</i> —Tier 3)	Category of measurement	Methodological guidance	
Topic 3.3.1: Generation of waste	a. Amount of waste generated by source	Mass	<ul style="list-style-type: none"> European Commission: European List of Waste, pursuant to European Waste Framework Directive Eurostat: Environmental Data Centre on Waste 	
	b. Amount of waste generated by waste category	Mass	<ul style="list-style-type: none"> By ISIC economic activity By households By tourists National Subnational 	
	c. Amount of hazardous waste generated	Mass	<ul style="list-style-type: none"> Eurostat: European Waste Classification for Statistics (EWC-Stat), version 4 (Waste categories) Basel Convention: Waste categories and hazardous characteristics Eurostat: Manual on Waste Statistics Eurostat: Guidance on classification of waste according to EWC-Stat categories SEEA Central Framework (2012) UNSD: Environment Statistics: Section—Waste Questionnaire 	
Topic 3.3.2: Management of waste	a. Municipal waste		<ul style="list-style-type: none"> Eurostat: Environmental Data Centre on Waste 	
	1. Total municipal waste collected	Mass	<ul style="list-style-type: none"> Eurostat metadata: Organisation for Economic Co-operation and Development (OECD)/Eurostat definition of municipal waste 	
	2. Amount of municipal waste treated by type of treatment and disposal	Mass	<ul style="list-style-type: none"> UNSD: Environment Statistics: Section—Waste Questionnaire 	
	3. Number of municipal waste treatment and disposal facilities	Number	<ul style="list-style-type: none"> Basel Convention: Waste categories and hazardous characteristics 	
	4. Capacity of municipal waste treatment and disposal facilities	Volume	<ul style="list-style-type: none"> Eurostat: EWC-Stat, version 4 (Waste categories) 	
	b. Hazardous waste		<ul style="list-style-type: none"> European Commission: European Waste Framework Directive (Waste treatment operations) Eurostat: Manual on Waste Statistics Eurostat: Guidance on classification of waste according to EWC-Stat categories Rotterdam Convention 	
	1. Total hazardous waste collected	Mass		
	2. Amount of hazardous waste treated by type of treatment and disposal	Mass		
	3. Number of hazardous waste treatment and disposal facilities	Number		
	4. Capacity of hazardous waste treatment and disposal facilities	Volume		
	c. Other/industrial waste			
	1. Total other/industrial waste collected	Mass		
2. Amount of other/industrial waste treated by type of treatment and disposal	Mass			
3. Number of other/industrial treatment and disposal facilities	Number			
4. Capacity of other/industrial waste treatment and disposal facilities	Volume			

d. Amount of recycled waste	Mass	<ul style="list-style-type: none"> • By specific waste streams (e.g., e-waste, packaging waste, end of life vehicles) • By waste category • National • Subnational
1. Imports of waste	Mass	• By waste category (e.g., chemical waste, municipal waste, combustion waste)
2. Exports of waste	Mass	
3. Imports of hazardous waste	Number	
4. Imports of hazardous waste	Volume	
Subcomponent 3.4: Release of Chemical Substances		
Topic 3.4.1: Release of chemical substances		<ul style="list-style-type: none"> • National • Subnational • FAOSTAT database • Stockholm Convention
a. Total amount of fertilizers used	Area, mass, volume	<ul style="list-style-type: none"> • National • Subnational • By ISIC economic activity (forestry, agriculture)
1. Natural fertilizers (also in 2.5.1.b and 2.5.3.b)	Area, mass, volume	<ul style="list-style-type: none"> • By ISIC economic activity (forestry, agriculture)
2. Chemical fertilizers (also in 2.5.1.b and 2.5.3.b)	Area, mass, volume	<ul style="list-style-type: none"> • By type of fertilizer
b. Total amount of pesticides used (also in 2.5.1.b and 2.5.3.b)	Area, mass, volume	<ul style="list-style-type: none"> • By type of pesticide
c. <i>Total amount of pellets used</i> (also in 2.5.2.e)	Mass, volume	<ul style="list-style-type: none"> • National • Subnational • Stockholm Convention
d. <i>Total amount of hormones used</i> (also in 2.5.2.e and 2.5.4.b)	Mass, volume	<ul style="list-style-type: none"> • By ISIC economic activity (aquaculture)
e. <i>Total amount of colourants used</i> (also in 2.5.2.e)	Mass, volume	<ul style="list-style-type: none"> • National • Subnational • By ISIC economic activity (aquaculture, livestock production)
f. <i>Total amount of antibiotics used</i> (also in 2.5.2.e and 2.5.4.b)	Mass, volume	<ul style="list-style-type: none"> • National • Subnational • By ISIC economic activity (aquaculture, livestock production)

Table A.1
The Basic Set of Environment Statistics (*continued*)

Component 4: Extreme Events and Disasters	
Subcomponent 4.1: Natural Extreme Events and Disasters	
Topic 4.1.1: Occurrence of natural extreme events and disasters	<ul style="list-style-type: none"> • By event • National • Subnational
1. Type of natural extreme event and disaster (geophysical, meteorological, hydrological, climatological, biological)	Description
2. Location	Location
3. Magnitude (where applicable)	Intensity
4. Date of occurrence	Date
5. Duration	Time period
a. People affected by natural extreme events and disasters	
1. Number of people killed	Number
2. Number of people injured	Number
3. Number of people homeless	Number
4. Number of people affected	Number
b. Economic losses due to natural extreme events and disasters (e.g., damage to buildings, transportation networks, loss of revenue for businesses, utility disruption)	Currency
c. Physical losses/damages due to natural extreme events and disasters (e.g., area and amount of crops, livestock, aquaculture, biomass)	Area, description, number
d. Effects of natural extreme events and disasters on integrity of ecosystems	
1. Area affected by natural disasters	Area
2. Loss of vegetation cover	Area
3. Area of watershed affected	Area
4. Other	Description
e. External assistance received	Currency
	<ul style="list-style-type: none"> • By event • National
Subcomponent 4.2: Technological Disasters	
Topic 4.2.1: Occurrence of technological disasters	<ul style="list-style-type: none"> • By event • CRED EM-DAT • UNECLAC: Handbook for Estimating the Socio-economic and Environmental Effects of Disasters
1. Type of technological disaster (industrial, transportation, miscellaneous)	Description
2. Location	Location
3. Date of occurrence	Date
4. Duration	Time period
a. People affected by technological disasters	
1. Number of people killed	Number
2. Number of people injured	Number
3. Number of people homeless	Number
4. Number of people affected	Number
b. Economic losses due to technological disasters (e.g., damage to buildings, transportation networks, loss of revenue for businesses, utility disruption)	Currency
c. Physical losses/damages due to technological disasters (e.g., area and amount of crops, livestock, aquaculture, biomass)	Area, description, number
d. Effects of technological disasters on integrity of ecosystems	
1. Area affected by technological disasters	Area
2. Loss of vegetation cover	Area
3. Area of watershed affected	Area
4. Other (e.g., for oil spills: volume of oil released into the environment, impact on ecosystem)	Description
e. External assistance received	Currency
	<ul style="list-style-type: none"> • By event • National

Component 5: Human Settlements and Environmental Health			
Subcomponent 5.1: Human Settlements			
Topic	Statistics and related information (Bold text —Core Set/Tier 1; regular text—Tier 2; <i>italicized text</i> —Tier 3)	Category of measurement	Potential aggregations and scales
Topic 5.1.1: Urban and rural population	a. Population living in urban areas	Number	<ul style="list-style-type: none"> Urban
	b. Population living in rural areas	Number	<ul style="list-style-type: none"> Rural
	c. Total urban area	Area	
	d. Total rural area	Area	
	e. Population living in coastal areas	Number	
	a. Population using an improved drinking water source	Number	<ul style="list-style-type: none"> Urban
	b. Population using an improved sanitation facility	Number	<ul style="list-style-type: none"> Rural
Topic 5.1.2: Access to selected basic services	c. Population served by municipal waste collection	Number	<ul style="list-style-type: none"> National Subnational
	d. <i>Population connected to wastewater collection system</i>	Number	<ul style="list-style-type: none"> By treatment type (e.g., primary, secondary, tertiary)
Topic 5.1.3: Housing conditions	e. Population connected to wastewater treatment	Number	<ul style="list-style-type: none"> National Subnational
	f. Population supplied by water supply industry	Number	<ul style="list-style-type: none"> National Subnational
	g. Price of water	Currency	<ul style="list-style-type: none"> By source (e.g., piped, vendor)
	h. Population with access to electricity	Number	
	i. Price of electricity	Currency	
	a. Urban population living in slums	Number	<ul style="list-style-type: none"> UN Habitat
b. Area of slums	Area	<ul style="list-style-type: none"> UNSD: MDG Indicator 7.10 Metadata 	
Topic 5.1.4: Exposure to ambient pollution	c. Population living in hazard-prone areas	Number	<ul style="list-style-type: none"> Urban
	d. Hazard-prone areas	Area	<ul style="list-style-type: none"> Rural
	e. <i>Population living in informal settlements</i>	Number	<ul style="list-style-type: none"> National
	f. <i>Homeless population</i>	Number	<ul style="list-style-type: none"> Subnational
	g. <i>Number of dwellings with adequacy of building materials defined by national or local standards</i>	Number	
	a. Population exposed to air pollution in main cities	Number	<ul style="list-style-type: none"> By pollutant (e.g., SO₂, NO_x, O₃)
	b. <i>Population exposed to noise pollution in main cities</i>	Number	<ul style="list-style-type: none"> WHO

Table A.1
The Basic Set of Environment Statistics (continued)

		Area		
Topic 5.1.5: Environmental concerns specific to urban settlements	a. Extent of urban sprawl	Area	• UN Habitat	
	b. Available green space	Area	• WHO	
	c. Number of private and public vehicles	Number	• By type of engine or type of fuel	
	d. Population using public modes of transportation	Number	• UNEP Urban Environment Unit	
	e. <i>Population using hybrid and electric modes of transportation</i>	Number		
	f. Extent of roadways	Length		
	g. <i>Existence of urban planning and zoning regulations and instruments in main cities</i>	Description		
	h. <i>Effectiveness of urban planning and zoning regulations and instruments in main cities</i>	Description		
	Subcomponent 5.2: Environmental Health			
	Topic 5.2.1: Airborne diseases and conditions	a. Airborne diseases and conditions		WHO
1. Incidence		Number	• By disease or condition	
2. Prevalence		Number	• National	
3. Mortality		Number	• Subnational	
4. <i>Loss of work days</i>		Number	• Urban	
5. <i>Estimates of economic cost in monetary terms</i>		Currency	• Rural	
Topic 5.2.2: Water-related diseases and conditions	a. Water-related diseases and conditions		• By gender	
	1. Incidence	Number	• By age group	
	2. Prevalence	Number	• By time period	
	3. Mortality	Number		
	4. <i>Loss of work days</i>	Number		
	5. <i>Estimates of economic cost in monetary terms</i>	Currency		
Topic 5.2.3: Vector-borne diseases	a. Vector borne diseases			
	1. Incidence	Number		
	2. Prevalence	Number		
	3. Mortality	Number		
	4. <i>Loss of work days</i>	Number		
	5. <i>Estimates of economic cost in monetary terms</i>	Currency		
Topic 5.2.4: Health problems associated with excessive UV radiation exposure	a. Problems associated with excessive UV radiation exposure			
	1. Incidence	Number		
	2. Prevalence	Number		
	3. <i>Loss of work days</i>	Number		
	4. <i>Estimates of economic cost in monetary terms</i>	Currency		
	Topic 5.2.5: Toxic substance- and nuclear radiation-related diseases and conditions	a. Toxic substance- and nuclear radiation-related diseases and conditions		WHO
1. Incidence		Number	• By category of toxic substance	
2. Prevalence		Number	• By disease or condition	
3. <i>Loss of work days</i>		Number	• National	
4. <i>Estimates of economic cost in monetary terms</i>		Currency	• Subnational	
			• Urban	
		• Rural		
		• By gender		
		• By age group		

Component 6: Environmental Protection, Management and Engagement				
Subcomponent 6.1: Environmental Protection and Resource Management Expenditure				
Topic	Statistics and related information <i>Bold Text—Core Set/Tier 1; Regular Text—Tier 2; Italicized Text—Tier 3</i>	Category of measurement	Potential aggregations and scales	
Topic 6.1.1: Government environmental protection and resource management expenditure	Government environmental protection and resource management expenditure			
	1. Annual government environmental protection expenditure	Currency	<ul style="list-style-type: none"> By environmental activity By type of expenditure: <ul style="list-style-type: none"> current, investment By ministry National Subnational By funding 	
	2. Annual government resource management expenditure	Currency	<ul style="list-style-type: none"> Eurostat-SERIEE Environmental Protection Expenditure Accounts Compilation Guide (202) Eurostat-Environmental Expenditure Statistics. General Government and Specialised Producers Data Collection Handbook (2007) Classification of Environmental Activities (CEA) SEEA Central Framework (2012) Annex 1 	
	a. Private sector environmental protection and resource management expenditure			
	1. Annual corporate environmental protection expenditure	Currency	<ul style="list-style-type: none"> By environmental activity By type of expenditure: <ul style="list-style-type: none"> current, investment By ISIC economic activity National Subnational 	
	2. Annual corporate resource management expenditure	Currency	<ul style="list-style-type: none"> Eurostat-SERIEE Environmental Protection Expenditure Accounts Compilation Guide (2002) Eurostat-Environmental Expenditure Statistics. General Government and Specialised Producers Data Collection Handbook (2007) 	
Topic 6.1.2: Corporate, non-profit institution and household environmental protection and resource management expenditure	Annual non-profit institution resource management expenditure	Currency		
	Annual household environmental protection expenditure	Currency		
	Annual household resource management expenditure	Currency		
	Subcomponent 6.2: Environmental Governance and Regulation			
	Topic 6.2.1: Institutional strength	Government environmental institutions and their resources	Description	<ul style="list-style-type: none"> National Subnational
		1. Name of main environmental authority and year of establishment	Description	
2. Annual budget of the main environmental authority		Currency		
3. Number of staff in the main environmental authority		Number		
4. List of environmental departments in other authorities and year of establishment		Description		
5. Annual budget of environmental departments in other authorities		Currency		
Topic 6.2.2: Other environmental institutions and their resources	6. Number of staff of environmental departments in other authorities	Number		
	1. Name of institution and year of establishment	Description		
	2. Annual budget of the institution	Currency		
	3. Number of staff in the institution	Number		

Table A.1
The Basic Set of Environment Statistics (continued)

Topic 6.2.2: Environmental regulation and instruments	a. Direct regulation		• By media (e.g., water, air, land, soil, oceans) • By ISIC economic activity • National • Subnational
	1. List of regulated pollutants and description (e.g., by year of adoption and maximum allowable levels)	Description, number	
	2. Description (e.g., name, year established) of licensing system to ensure compliance with environmental standards for businesses or other new facilities	Description	
	3. Number of applications for licences received and approved per year	Number	
	4. List of quotas for biological resource extraction	Number	
	5. Budget and number of staff dedicated to enforcement of environmental regulations	Currency, number	
	b. Economic instruments		
	1. List and description (e.g., year of establishment) of green/ environmental taxes	Description, currency	
	2. List and description (e.g., year of establishment) of environmentally relevant subsidies	Description, currency	
	3. List of eco-labelling and environmental certification programmes	Description	
	4. Emission permits traded	Number, currency	
Topic 6.2.3: Participation in MEAs and environ- ment conventions	a. Participation in MEAs and other global environmental conventions		MEA secretariats
	5. List and description (e.g., country's year of participation) ^d of MEAs and other global environmental conventions.	Description, number	
Subcomponent 6.3: Extreme Event Preparedness and Disaster Management			
Topic 6.3.1: Preparedness for natural extreme events and disasters	a. National natural extreme event and disaster preparedness and management systems		• National • Subnational
	1. Existence of national disaster plans/programmes	Description	• International Emergency Management Organization (IEMO) • UNISDR • Hyogo Framework for Action
	2. Description (e.g., number of staff) of national disaster plans/programmes	Description	
	3. Number and type of shelters in place or able to be deployed	Description, number	
	4. Number and type of internationally certified emergency and recovery management specialists	Description, number	
	5. Number of volunteers	Number	
	6. Quantity of first aid, emergency supplies and equipment stockpiles	Number	
	7. Existence of early warning systems for all major hazards	Description	
	8. Expenditure on disaster prevention, preparedness, clean-up and rehabilitation	Currency	

Table A.1
The Basic Set of Environment Statistics (continued)

Topic 6.3.2: Preparedness for technological disasters	a. National technological disaster preparedness and management systems 1. <i>Existence and description (e.g., number of staff) of public disaster management plans/programmes (and private when available)</i> 2. <i>Expenditure on disaster prevention, preparedness, clean-up and rehabilitation</i>	Description	
Subcomponent 6.4: Environmental Information and Awareness			
Topic 6.4.1: Environmental information	a. Environmental information systems 1. Existence of publicly accessible environmental information system 2. Annual number of visits/users of specific environmental information programmes or environmental information systems b. Environment statistics 117 Description of national environment statistics programmes (e.g., existence, year of establishment, lead agency, human and financial resources) 3. <i>Number and type of environment statistics products and periodicity of updates</i> 4. Existence and number of participant institutions in inter-agency environment statistics platforms or committees	Description	• National • Subnational
Topic 6.4.2: Environmental education	a. Environmental education 1. <i>Allocation of resources by central and local authorities for environmental education</i> 2. <i>Number and description of environmental education programmes in schools</i> 3. <i>Number of students pursuing environment-related higher education (e.g., science, management, education, engineering)</i>	Currency Description, number Number	
Topic 6.4.3: Environmental perception and awareness	a. Public environmental perception and awareness 1. <i>Knowledge and attitudes about environmental issues or concerns</i> 2. <i>Knowledge and attitudes about environmental policies</i>	Description	
Topic 6.4.4: Environmental engagement	a. Environmental engagement 1. Existence of pro-environmental NGOs (number of NGOs and their respective human and financial resources) 2. <i>Number of pro-environmental activities</i> 3. <i>Number of pro-environmental programmes</i>	Currency, number Number Number	

^d Participation means that the country or area has become party to the agreements under the treaty or convention, which is achieved through various means, depending on the country's circumstances, namely: accession, acceptance, approval, formal confirmation, ratification and succession. Countries or areas that have signed but not become party to the agreements under a given convention or treaty are not considered to be participating.

Annex B

Developments since 1984

B.1. A number of relevant policy and conceptual developments have occurred since the original FDES was published in 1984. Policymaking goals in the field of the environment and sustainable development have usually been accompanied by implicit or explicit frameworks and, in some cases, indicator sets to monitor progress. They have also generally used or proposed a specific conceptualization of environmental- or environmental sustainability-related phenomena. Annex B reviews the main conceptual and policy developments relevant to environment statistics since 1984, together with the most important developments in frameworks for environmental statistics and indicators.

Conceptual and policy developments and related frameworks

Sustainable development

B.2. The concept of sustainable development came to the forefront in 1986 when the United Nations World Commission on Environment and Development, led by Gro Harlem Brundtland, presented it as an alternative approach to economic growth that could “meet the needs of the present without compromising the ability of future generations to meet their own needs”.¹¹⁷ This was a synergistic approach that would replace the previously held view of economic growth and the health of the environment as competing interests. The outcome document, *Our Common Future*,¹¹⁸ was a strategy paper intended to inform the formulation of global policy in a wide array of areas relating the environment to the economy within the development context.

B.3. Subsequent to the work of that Commission, the United Nations Conference on Environment and Development (UNCED), or Earth Summit, held in Rio de Janeiro, Brazil in June 1992, gave rise to a fresh round of interest. It produced policy directives for the environment. Agenda 21, the Summit’s agreed programme of action for the implementation of sustainable development, called for comprehensive global action in all areas of sustainable development, in particular “improved living standards for all, better protected and managed ecosystems and a safer, more prosperous future”.¹¹⁹ The declarations issued by the Summit included:

- i. The Rio Declaration on Environment and Development, affirming that scientific uncertainty should not delay measures to prevent environmental degradation where there are threats of serious or irreversible damage and that States have a right to exploit their own resources but not to cause damage to the environment of other States;¹²⁰
- ii. The Statement of Forest Principles, calling on all countries to make an effort to “green the world” (through reforestation and forest conservation).¹²¹

B.4. Three international environmental treaties¹²² also resulted directly from the Rio Summit. These “Rio Conventions” are:

¹¹⁷United Nations, World Commission on Environment and Development (1987). *Our Common Future*, Oxford University Press.

¹¹⁸ Ibid.

¹¹⁹ United Nations “Agenda 21”, United Nations Conference on Environment and Development, Rio de Janeiro, Brazil, 3 to 14 June 1992, available from <http://sustainabledevelopment.un.org/content/documents/Agenda21.pdf> (accessed 4 August 2017).

¹²⁰ United Nations (1992). “Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992, Annex I”, available from www.un.org/documents/ga/conf151/aconf15126-1annex1.htm (accessed 4 August 2017).

¹²¹ United Nations (1992). “Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992, Annex III”, available from www.un.org/documents/ga/conf151/aconf15126-3annex3.htm (accessed 4 August 2017).

¹²² A more detailed description of the conventions and MEAs can be seen in Annex C.

- i. The UNFCCC, with the objective of stabilizing GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system;
- ii. The Convention on Biological Diversity (CBD), which represented a dramatic step forward in the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the use of genetic resources; and
- iii. The United Nations Convention to Combat Desertification (UNCCD), which is the only international legally binding instrument to effectively tackle desertification and the effects of drought.

B.5. In 2002, ten years after the Rio Summit, the follow-up World Summit on Sustainable Development (WSSD) was held in Johannesburg, South Africa in August-September 2002. The Johannesburg Summit strengthened the scope of sustainable development, emphasizing the need to protect ecosystems and achieve integrated management of land, water and living resources, while building regional, national and local capacities. The outcome document of that Summit, the Johannesburg Declaration on Sustainable Development¹²³ and the Plan of Implementation of the World Summit on Sustainable Development¹²⁴, recognized that protecting and managing the natural resource base for economic and social development is one of the overarching objectives of and essential requirements for sustainable development. It also noted that healthy ecosystems and healthy environments are invaluable to ensure the ability of present and future generations to meet their own needs. As enshrined in that Declaration, sustainable development encompassed three basic pillars—economic development, social development and environmental protection—at the local, national, regional and global levels.

B.6. The next follow-up conference, the United Nations Conference on Sustainable Development (UNCSD), Rio+20, was held in Rio de Janeiro in June 2012. The outcome document of the Conference, titled “The Future We Want” (A/CONF.216/L.1)¹²⁵ addresses six areas: i) Our common vision, ii) Renewing political commitment, iii) Green economy in the context of sustainable development and poverty eradication, iv) Institutional framework for sustainable development, v) Framework for action and follow-up and vi) Means of implementation. The agreement adopted in Rio calls for the United Nations General Assembly (UNGA) to undertake a number of tasks: designate a body to operationalize the 10-Year Framework of Programmes on sustainable consumption and production; determine the modalities for the Third International Conference on Small Island Developing States (SIDS); identify the format and organization of the High-Level Political Forum, which is to replace the Commission on Sustainable Development (CSD); strengthen UNEP; constitute an open working group to develop global SDGs to be agreed by the UNGA; establish an intergovernmental process under the UNGA to prepare a report proposing options on an effective sustainable development financing strategy; and consider a set of recommendations from the Secretary-General for a facilitation mechanism to promote the development, transfer and dissemination of clean and environmentally sound technologies.

B.7. The outcome document of the Rio+20 Conference emphasized the need to strengthen the monitoring of sustainable development by improving data collection and establishing indicators. High priority was given to the availability and quality of environment statistics to monitor environmental sustainability and green economy achievements. The documents noted the growing need to develop and combine statistics and indicators beyond GDP that are more inclusive of environmental and social aspects in order to cover the full realm of sustainable development. Comparable and regularly collected environment statistics were emphasized as critical to strengthen measurement of the environmental pillar, which would contribute to measuring beyond GDP. The FDES 2013 and the Basic Set of Environment Statistics will pro-

¹²³ United Nations (2002). “Report of the World Summit on Sustainable Development”, Johannesburg Declaration on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002, available from www.un-documents.net/jburgdec.htm (accessed 4 August 2017)

¹²⁴ United Nations (2002). “Report of the World Summit on Sustainable Development”, Plan of Implementation of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002, available from www.un-documents.net/jburgpln.htm (accessed 4 August 2017).

¹²⁵ United Nations (2012). Rio+20 outcome document, “The Future We Want”, available from <https://sustainabledevelopment.un.org/futurewewant.html> (accessed 4 August 2017).

vide appropriate tools to assist countries in this regard. UNSD's efforts, in collaboration with UNEP, to strengthen environmental information, data and indicators, were deemed important. The document also emphasized the embedding of geospatial information in environment statistics. In short, the results of the outcome document were extremely positive with regard to acknowledging the need to strengthen the production of environment statistics.

B.8. Advancing the conceptual aspects of sustainable development has provided additional motivation to assess the progress and implementation gaps in meeting previously agreed commitments and addressing new and emerging challenges. In this regard, the renewed call for political commitment to this concept at Rio+20 offered strong backing for developing sustainable development policies.

B.9. The Samoa Pathway, the outcome document of the Third International Conference on SIDS¹²⁶ includes a section on data and statistics that specifically mentions the work of the international statistical community. In this regard, the importance of strengthening national statistical systems to face the challenge of increased demands for data is evident. The document recognized that improved data collection and statistical analysis are required to enable SIDS to effectively plan, follow up on, evaluate the implementation of and track successes in attaining the internationally agreed development goals.

¹²⁶ United Nations Conference on Small Island Developing States, "The Samoa Pathway", available from www.sids2014.org/index.php?menu=1537 (accessed 4 August 2017).

B.10. These clear policy positions on sustainable development, taken after the publication of the FDES in 1984, have had direct relevance to the area of environment statistics. It is critical to take them into consideration in this revision, as the concept of sustainable development has played a defining role in helping to coalesce thinking around well-defined and representative goals regarding the state of the environment. This concept of sustainable development underscores the point that the environment must be conserved, while ensuring the economic and social well-being of the world's human population. Adequate response to these initiatives has contributed significantly to defining the statistical needs in this area. Any subsequent conceptual approaches to describing the environment must respond to them and enable a better understanding of environmental sustainability, contribute to assessment and support decision-making.

B.11. Twenty-two years after Rio and approximately 30 years after the original FDES, the environment statistics community faces a new opportunity to strengthen methodology in the area of environment statistics, while policy-driven processes can support and strengthen official environment statistics programmes at the national, regional and global levels.

Climate change

B.12. According to prevailing climate change science, human activity, particularly the burning of fossil fuels, has made the blanket of GHGs around the earth "thicker".¹²⁷ The UNFCCC has affirmed that climate change is one of the greatest challenges of our time.¹²⁸ The world's climate is changing and will continue to change at rates unprecedented in recent human history. The impacts and risks associated with these changes are already happening in many systems and sectors essential for human livelihood, including water resources, food security, coastal zones and health. Adaptation to the adverse effects of climate change is vital to reduce current and future impacts. In this context, there is an urgent need for an integrated policy response to the climate change and development challenge.

¹²⁷ United Nations Framework Convention on Climate Change, "Climate Change Information Sheet 1", available from <http://unfccc.int/cop3/fccc/climate/fact01.htm> (accessed 4 August 2017).

¹²⁸ United Nations Framework Convention on Climate Change (2011). "Report of the Conference of the Parties on its sixteenth session", held in Cancun from 29 November to 10 December 2010, available from <http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf> (accessed 4 August 2017).

B.13. The Kyoto Protocol emerged from the UNFCCC. It is an international agreement whose major feature is setting binding targets to reduce GHG emissions (as of mid-2011) for 37 industrialized countries and the European community. Unlike the UNFCCC, it provides binding targets rather than encouraging signatories to attain these goals. The Kyoto mechanisms have been designed to:

- i. Stimulate sustainable development through technology transfer and investment;
- ii. Help countries with Kyoto commitments to meet their targets by reducing emissions or removing carbon from the atmosphere in other countries in a cost-effective way; and
- iii. Encourage the private sector and developing countries to contribute to emission reduction efforts.

B.14. The complexity of the climate system means that predictions vary widely, but even minimal changes in forecasts could mean frequently flooded coastlines, disruptions to food and water supplies and the extinction of many species. Accordingly, parties are required to undertake efforts to:

- i. Mitigate climate change, stabilizing GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system;
- ii. Reduce GHG emissions;
- iii. Enhance action on adaptation to the adverse effects of climate change. This is vital to reduce the current impacts of climate change and increase resilience in the face of future impacts; and
- iv. Promote and cooperate in research and systematic observations of the climate system, including through support to existing international programmes and networks.

B.15. Due to the complexity of the driving forces and the direct and indirect impacts of climate change, most domains of environment statistics are relevant to climate change statistics. Therefore, there is increased demand for environment statistics that can be used to monitor, at different scales, the stages and sequences of climate change, such as contributing emissions, mitigation, impact and adaptation. NSOs around the world find it difficult to provide this type of information. Clear inter-institutional cooperation and new resources are needed to produce climate change statistics on a timely basis that are nationally and globally relevant.

Monitoring the Millennium Development Goals (MDGs)

B.16. In 2000, the Millennium Summit of the United Nations was held in New York. At this Summit, world leaders adopted the United Nations Millennium Declaration, which includes a statement of values, principles and objectives for the international agenda for the twenty-first century and sets deadlines for many collective actions. The framework for monitoring MDGs is intended as a tool to follow up on the Millennium Declaration. As a framework to monitor progress on meeting internationally agreed targets and goals by 2015, it reflects the global consensus over a wide range of development challenges, including those related to the environment. It comprises eight goals that are, in turn, composed of targets and specific indicators to monitor progress towards each of the agreed targets. Goal 7: Ensure environmental sustainability, can be monitored through its four targets and 10 indicators. Of those, only two indicators have a quantifiable target to be achieved by 2015. National, regional and global reporting on the progress measured by these 10 indicators has increased, but data gaps and discrepancies among national and international sources have persisted, particularly with regard to this goal. The MDG indicator framework is policy driven and its purpose is to monitor progress in achieving targets.

Emergence of the SDGs, targets and indicators to guide the post-2015 development agenda

B.17. At Rio+20, governments agreed to launch a process to develop a set of SDGs. They asked that an Open Working Group (OWG) of 30 elected UN Member States be created to develop a proposal for SDGs through an inclusive and transparent intergovernmental process open to all stakeholders. The Member States decided to use an innovative, constituency-based system of representation that was new to bodies with limited membership. Thus, most of the OWG seats were shared by several countries working together through 13 sessions. On 19 July 2014, the OWG completed its mandate at the final formal session by adoption by acclamation, the OWG final outcome proposal containing the Chapeau and the proposed 17 goals and 169 targets, including 62 targets on means of implementation. The OWG adopted its outcome proposal, the Proposal of the Open Working Group for Sustainable Development Goals, by acclamation. The proposal was submitted to the UNGA for consideration and appropriate action at its 69th session. At the point of submission to the UNGA, no indicators had been proposed. However, once they have been identified, systematic data production and collection for these indicators will have to be established or strengthened within national statistical systems.

B.18. Of the 17 goals proposed by the OWG, the ones that are directly related to the environment are as follows:

- Goal 6: Ensure availability and sustainable management of water and sanitation for all;
- Goal 7: Ensure access to affordable, reliable, sustainable, and modern energy for all;
- Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable;
- Goal 12: Ensure sustainable consumption and production patterns;
- Goal 13: Take urgent action to combat climate change and its impacts;
- Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development; and
- Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.

B.19. The SDG and targets are contained in the document “Transforming Our World: The 2030 Agenda for Sustainable Development. Outcome Document for the UN Summit to Adopt the Post-2015 Development Agenda: Draft for Adoption”. This outcome document was finalized in 31 July 2015 during the last round of intergovernmental negotiations in New York. The document consists of a preamble and an introduction, the SDGs proposal containing goals and targets, a section on means of implementation and global partnership, and a section describing the follow-up and review process. It is expected that the SDGs will be formally approved in the UN Summit to adopt the post-2015 Development Agenda (25-27 September 2015), which will be convened as a high-level plenary meeting of the General Assembly.

Beyond GDP, green economy and green growth

B.20. Developments related to environment statistics also involved the creation, in early 2008, of the Stiglitz-Sen-Fitoussi Commission. It was set up to address issues related to the measurement of economic performance and social progress. A central underlying assumption and motive was the recognition that the best known measure of economic activity, GDP, was not a sufficient and appropriate guide for modern policymaking to address social and environmental objectives. One of the recommendations of *The Stiglitz Report*¹²⁹ proposed that the environmental aspects of sustainability deserve a separate follow-up based on a well-chosen set of physical indicators. In particular, there is a need for a clear indicator of the earth’s proximity

¹²⁹ Stiglitz, Joseph, *The Stiglitz Report: Reforming the International Monetary and Financial Systems in the Wake of the Global Crisis*, New York, The New Press, 2010.

to dangerous levels of environmental damage, such as those associated with climate change or the depletion of fishing stocks. This further underscored the need for a responsive environment statistics framework.

B.21. Two other concepts, the “green economy” and “green growth”, complement the concept of sustainable development. A green economy improves human well-being and social equity, while significantly reducing environmental risks and ecological scarcities. It is characterized by low environmental risks (e.g., low carbon), social inclusiveness and resource efficiency. The core of this initiative involves stimulating investment in green sectors of the economy, while ameliorating those sectors that are environmentally unsustainable. According to UNEP, “A green economy can be defined as an economy that results in improved human well-being and reduced inequalities over the long term, while not exposing future generations to significant environmental risks and ecological scarcities.”¹³⁰ A green economy “is characterized by substantially increased investments in economic sectors that build on and enhance the earth’s natural capital or reduce ecological scarcities and environmental risks. These investments and policy reforms provide the mechanisms and the financing for the reconfiguration of businesses, infrastructure and institutions and the adoption of sustainable consumption and production processes. Such reconfiguration leads to a higher share of green sectors contributing to GDP, greener jobs, lower energy and resource intensive production, lower waste and pollution and significantly lower GHG emissions.”¹³¹ Targeted efforts and policies in a green economy must be geared towards reducing environmental risks and scarcities, while ensuring compatibility with reducing global poverty and social inequity. For example, in pursuing investment in renewable energy, care must be taken to ensure access to clean and affordable energy.

B.22. Specific indicators to measure the green economy have not yet been identified or agreed upon, but work in this area involving UNEP, OECD and the World Bank suggests that they will encompass the following broad areas:

- i. Economic indicators: for example, share of investments or the share of output and employment in sectors that meet a sustainability standard, such as green GDP;
- ii. Environmental indicators: for example, resource use efficiency or pollution intensity at either the sectoral or economy-wide level, such as, energy use/GDP, or water use/GDP; and
- iii. Aggregate indicators of progress and well-being: for example, macroeconomic aggregates to reflect natural capital depreciation, including integrated environmental and economic accounting, or broader interpretations of well-being beyond the narrow definition of GDP per capita.

B.23. “Green growth” expresses a different but related concept. According to the OECD, “green growth is about fostering economic growth and development while ensuring that the natural assets continue to provide the resources and environmental services on which our well-being relies” and it emphasizes that “it must catalyse investment and innovation which will underpin sustained growth and give rise to new economic opportunities.”¹³² OECD had proposed a complete set of indicators, including headline indicators in 2014.¹³³ They are structured with a measurement framework that includes the following categories:

- i. Indicators for monitoring the environmental and resource productivity of the economy;
- ii. Indicators describing the natural asset base;
- iii. Indicators monitoring the environmental dimension of quality of life; and
- iv. Indicators describing policy responses and economic opportunities.

¹³⁰ United Nations Environment Programme (2012). “Measuring Progress Towards an Inclusive Green Economy”, available from www.unep.org/greeneconomy/sites/unep.org/greeneconomy/files/publications/measuring_progress_report.pdf (accessed 4 August 2017).

¹³¹ United Nations Environment Programme. “Green Economy Report: A Preview”, available from www.unep.ch/etb/publications/Green%20Economy/GER%20Preview%20v2.0.pdf (accessed 4 August 2017).

¹³² Organisation for Economic Co-operation and Development (2014). “OECD Green Growth Studies: Green Growth Indicators 2014”, available from www.oecd.org/greengrowth/greengrowthindicators.htm (accessed 4 August 2017).

¹³³ Ibid.

Conceptual approaches to structuring environment statistics

B.24. Two conceptual approaches that show potential for organizing environment statistics and may go beyond a purely academic exercise are the natural capital and the ecosystem approaches. In different contexts and for distinct purposes, they have become essential for understanding interrelationships within the environment at highly complex levels. A short discussion follows of the basic principles of each of these two well-established lines of reasoning.

Natural capital approach

B.25. The natural capital approach has been defined as a means to identify and quantify the natural environment and associated ecosystem services, leading to better decision-making for managing, preserving and restoring natural environments. Capital theory has played a large part in economic development theories. Society's total capital base comprises natural, economic, human and social capital. Natural capital, in the form of land, has been included as one of the factors of production from the birth of economic thought. Natural capital can be divided into three principal categories: natural resource stocks, land and ecosystems. Natural capital provides goods and essential functions to the economy, as well as services to humans and other living beings.

B.26. Natural capital performs four types of basic functions:

- i. Provision of raw materials for production and consumption;
- ii. Assimilation of the waste products of production and consumption;
- iii. Provision of amenity services (cultural services); and
- iv. Provision of basic life support functions on which human life depends.¹³⁴

B.27. This approach incorporates the stock concept of natural capital, as well as a flow concept of provision of services. Long-term economic development and sustainability depend on both of these factors, which are critical to the survival of humankind and other species.

B.28. Various methods of measuring natural capital have been performed. Notably, the World Bank made significant progress on measuring the real wealth and genuine savings of nations. The SEEA-CF may also be used to measure natural capital and its use in physical and monetary terms.

B.29. In addition, a joint UNECE/Eurostat/OECD Working Group on Statistics on Sustainable Development¹³⁵ reached a common understanding on the principles of measuring sustainability and began working to develop a small core set of indicators. The outcome is presented in the publication, *Measuring Sustainable Development*.¹³⁶ To follow up on this work, a Joint UNECE/Eurostat/OECD Task Force on Measuring Sustainable Development (TFSD) was created, implicitly linked to and inspired by other initiatives such as "GDP and Beyond"¹³⁷ (European Commission), "Better Life Initiative: Measuring Well-being and Progress" (OECD) and the Sponsorship Group on "Measuring Progress, Well-being and Sustainable Development"¹³⁸ (European Statistical System).

B.30. The Task Force published a report in 2014¹³⁹ presenting the recommendations of the CES on measuring sustainable development. The publication conveyed key messages about measuring sustainable development, the need for harmonization, and proposed a procedure to select potential indicators on transboundary impacts. It included a measurement framework intended to link the SDI sets currently produced by national and international statistical organizations, and provided a basis for formulating a list of potential indicators. Three conceptual dimensions and 20 themes were distinguished covering environmental, social and economic aspects of sustainable development. Based on the measurement framework, a methodology to derive three indicator sets was proposed: a large set of 60 indicators selected on a conceptual

¹³⁴ Dietz, Simon and Neumayer, Eric (2007). "Weak and strong sustainability in the SEEA: concepts and measurement", *Ecological Economics*, 61 (4), pp. 617-626, available from http://eprints.lse.ac.uk/3058/1/Weak_and_strong_sustainability_in_the_SEEA_%28LSE%29.pdf (accessed 4 August 2017).

¹³⁵ United Nations Economic Commission for Europe (2014). *Statistics on Sustainable Development*, available from www.unece.org/stats/sustainable-development.html (accessed 4 August 2017).

¹³⁶ United Nations Economic Commission for Europe/Organisation for Economic Co-operation and Development/Eurostat (2009). *Measuring Sustainable Development*, available from www.unece.org/fileadmin/DAM/stats/publications/Measuring_sustainable_development.pdf (accessed 4 August 2017).

¹³⁷ Commission of the European Communities (2009), "GDP and Beyond", available from <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0433:FIN:EN:PDF> (accessed 4 August 2017).

¹³⁸ European Statistical System (2011), "Measuring Progress, Well-being and Sustainable Development", available from <http://ec.europa.eu/eurostat/documents/42577/43503/SpG-Final-report-Progress-wellbeing-and-sustainable-dev.pdf> (accessed 4 August 2017).

¹³⁹ United Nations Economic Commission for Europe (2014). "Conference of European Statisticians Recommendations on Measuring Sustainable Development", available from www.unece.org/fileadmin/DAM/stats/publications/2013/CES_SD_web.pdf (accessed 4 August 2017).

basis; a large set of 90 indicators selected on a thematic basis including more detailed policy relevant indicators; and a small set of 24 potential indicators to communicate the main messages more efficiently to policymakers and the general public. Although the proposed sustainability themes are considered universal, country-specific indicators may be selected. An important conclusion in the report was that SDI sets should reflect the transboundary impacts of sustainable development by highlighting how a country, in the pursuit of the well-being of its citizens, may affect the well-being of citizens of other countries.

B.31. The natural capital approach may be applied to different levels. Fundamental concepts such as strong and weak sustainability are based on the assessment of stocks and flows of different types of capital in any given territory, but methodological difficulties in measuring the components of natural capital and its services can explain the slow progress in this regard. The natural capital approach is a strong foundation for structuring physical data without the need for monetary valuation, particularly to produce data about stocks and flows. Statistical production based on monetary value appears to be scarce today. Given incomplete scientific knowledge of many ecosystem dynamics and the effect of the permanent interrelations between nature and human activity, additional methodological problems arise from the choice of variables to be integrated into the stocks and services from nature.

B.32. Statistical frameworks that make it possible to monitor the amount and quality of natural assets (despite limitations relating to measurement) are therefore an invaluable tool for assessing and assigning relative importance to society's natural capital base. This is a long-standing need among natural resource intensive-countries.

The ecosystem approach

B.33. The ecosystem approach was originally conceived as the strategic concept for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way,¹⁴⁰ as opposed to per individual parts of the systems. As a more holistic approach, where parts interacting together constantly modify everything else, the ecosystem view considers spatially defined units (such as basins, forest, marine and dryland) in an integrated fashion at the local, national or global levels, applying appropriate scientific methodologies.

B.34. The ecosystem approach has been used primarily for integrated natural resources management (including forests and river basins) and, more recently, for integrated assessment purposes.

B.35. The assessment perspective has been implemented in the Millennium Ecosystem Assessment that the United Nations called for in 2001. The Millennium Ecosystem Assessment¹⁴¹ uses an innovative framework that considers both the ecosystem and its services (provisioning, regulating, supporting and cultural). It reports on the status of 24 services, categorizing those that are in debt, identifying the stocks that are running short and where the fabric of life is deteriorating.

B.36. The Millennium Ecosystem Assessment did not present a matrix for organizing its findings, but used 10 ecosystem categories and subcategories to report the findings on different aspects and with distinct emphases. These reporting categories include a number of ecosystems. They are not mutually exclusive, as their areas can and do overlap. Ecosystems within each reporting category¹⁴² share a suite of biological, climatic and social factors that tend to differ across categories. Within each category of ecosystems, an exhaustive global assessment is presented, which includes ecosystem quality, changes in the ecosystem services produced and ecosystem trends. These reporting categories created by the Millennium Ecosystem Assessment, as well as its conceptual understanding of the relations between people and ecosys-

¹⁴⁰ Convention on Biological Diversity. COP 5 Decision V/6, paragraph A.1, available from www.cbd.int/decision/cop/?id=7148 (accessed 4 August 2017).

¹⁴¹ The objective of this assessment was to provide a clear, scientific picture of the current state of the Earth's ecosystems at multiple scales, deepening understanding of the relationship and linkages between ecosystems and human well-being, including economic, social and cultural aspirations (see Millennium Ecosystem Assessment (2005). *Ecosystems and Human Well-being: Synthesis*, Washington, D.C., Island Press, available from www.millenniumassessment.org/documents/document.356.aspx.pdf (accessed 4 August 2017).

¹⁴² Ibid.

tems,¹⁴³ showed potential first as a possible structuring set of ecosystem types and, finally, as a rich conceptual construct underpinning the structure of the FDES 2013.

¹⁴³ Ibid.

B.37. As a conceptual construct, this approach sets out to value and recognize ecosystem services that would otherwise not be explicitly acknowledged and accounted for. It is based on the application of appropriate scientific methodologies and focused on levels of biological organization which encompass the essential structure, processes, functions and interactions among organisms and their environment. It recognizes humans, with their cultural diversity, as an integral component of many ecosystems. As such, in principle it is realistic in promoting understanding of the environment and assessing the complex nature of interactions among the different components of the ecosystem. It delineates the environment into spatially recognizable units that are influenced by associated seasonality and flora, along with physical data such as elevation, humidity and drainage. However, the focus of the ecosystem approach is designed to trigger management interventions, which must invariably be carried out in an economic and political context. Consequently, it has also acquired economic and political significance.

B.38. The ecosystem approach is thus an important conceptual framework that can be used in environment statistics to model the structure and contents of the information to be produced by any given country or at any scale, and it contributed to the development of the FDES.

B.39. The Economics of Ecosystems and Biodiversity (TEEB) study was initiated in 2007 and integrates the ecosystems approach and the natural capital concept. Its objectives are to assess the global economic costs of ecosystem degradation and biodiversity loss and recommend solutions for policymakers, administrators, businesses and individuals. As such, it underscored economic and political characteristics. The study revealed that ecosystems are invisible and that losses accruing to them are therefore largely invisible. These losses to the ecosystems are treated as externalities—costs arising from activities that do not accrue to the persons or organizations performing the activities. Over time, these represent a significant diminution of natural capital. According to UNEP these losses “hurt the poor most because their livelihoods and incomes depend most on ecosystem services”.¹⁴⁴

¹⁴⁴ United Nations Environment Programme (2010), “Our Planet, September 2010”.

B.40. The FDES 2013 draws its conceptual foundation from both the natural capital and the ecosystem approaches, not necessarily as its structural backbone, but as complementary ways of thinking about and designing the content and building blocks of the components, topics and subtopics included in the FDES.

Evolution of frameworks for environment statistics and environmental-economic accounting

Environment statistics and indicator frameworks

B.41. Over the years, growing environmental concerns triggered the development of structured frameworks to identify and organize environment statistics that could adequately help the definition and the monitoring of policy goals and targets, and organize information on the environment and its sustainability. Following is a review of the major environment statistics and indicator frameworks relevant to the FDES formulation.

The stress-response framework and its derivatives

B.42. The stress-response approach was developed in response to the shortcomings of the media approach which described processes of environmental change by disaggregating them into different environmental media (including land, water and air). Seeking to organize environmental data into a more structured framework, this approach focused on the impacts of human intervention within the environment (stress) and the environment’s subsequent transformation

¹⁴⁵ Rapport, David and Friend, Anthony (1979). "Towards a Comprehensive Framework for Environment Statistics: a Stress-response Approach", Ottawa, Statistics Canada.

(environmental response). The original approach was developed by Statistics Canada in 1979 as a "Structural Framework for the S-RESS".¹⁴⁵ The stress-response approach relates a set of activities that exert stress on the environment (such as waste generation, extraction of natural resources and the production of hazardous substances) to the following data categories:

- i. Measures of stressors, that is, of human and natural activities which possess the potential to degrade the quality of the natural environment, to affect the health of man, to threaten the survival of species, to place pressures on non-renewable resources, and to cause a deterioration in the quality of human settlements;
- ii. Measures of stress, that is, of the elements that place pressures on and contribute to the breakdown of the natural and human-made environment such as the emission of pollutants;
- iii. Measures of environmental response, that is, of the observed effects of stress on the natural and human-made environment;
- iv. Measures of collective and individual response, that is, of human's reactions to environmental changes such as environmental protection and conservation; and
- v. Measures of stocks, that is of the stocks of natural resources, human-made structures and potentially hazardous substances .

B.43. Work on the stress-response framework culminated in the introduction of the S-RESS framework, which was later adapted and modified to be used as a similar sequence of columns in the main matrix of the 1984 FDES.

B.44. The 1984 FDES framework was designed to reflect the sequence of action, impact and reaction that could trace the relationships among social and economic activities and natural events, their effects on the environment and the responses to these effects by public organizations and individuals. The FDES was used by many countries, and it was made operational in the UNSD's data collection for environment statistics at the international level. Its basic structure arranged environmental media as rows and placed the sequence adapted from the stress-response in columns, thus positioning topics in the resulting cells of the table. These environment statistics topics were further developed to more disaggregated levels in annexes and separate publications. One important shortcoming of the FDES was that practitioners and users could assume that the relationships among the stages of the sequence were linear.

¹⁴⁶ Organisation for Economic Co-operation and Development (1993), Environment Monographs, No. 83, "OECD Core Set of Indicators for Environmental Performance Reviews".

B.45. The PSR framework is another environmental framework that has been used widely since the FDES was developed. The PSR is itself an adaptation of the S-RESS framework, which was the culmination of work on the stress-response framework. The PSR framework recognized that human activities exert pressures (such as pollution emissions or land use changes) on the environment, which can, in turn, induce changes in the state of the environment (e.g., changes in ambient pollutant levels, habitat diversity and water flows). Society then responds to these changes in pressures or state with environmental and economic policies and programmes intended to prevent, reduce or mitigate the pressures and/or environmental damage. The responses form a feedback loop to impose pressure through human activities. In a wider sense, these steps form part of an environmental policy cycle that includes problem perception, policy formulation, and monitoring and policy evaluation.¹⁴⁶

¹⁴⁷ United Nations Statistics Division, Expert Group Meeting on the Revision of the FDES (2010), "Criteria for a Conceptual Framework for Developing Environment Statistics", Robert Smith and Michael Bordt, Statistics Canada, available from <http://unstats.un.org/unsd/environment/fdes/EGM1/EGM-FDES.1.14-Criteria%20for%20a%20Conceptual%20Framework%20for%20Developing%20Environment%20Statistics%20-%20Robert%20Smith%20&%20Michael%20Bordt.pdf> (accessed 4 August 2017).

B.46. PSR frameworks are useful for classifying and reporting existing data. The indicators derived from them are functional and well known. However, they cannot reveal which statistical topics or even variables that could be missing. Additionally, while PSR-type frameworks tend to focus on the harmful aspects of the human-ecosystem relationship, they do not distinguish between beneficial and harmful stressors and impacts.¹⁴⁷ PSR frameworks also tend to suggest, or have been interpreted to suggest, linear relationships in the human activity-

environment interaction. This obstructs the view of more complex relationships in ecosystems and in environment-economy interactions.

B.47. The establishment of the United Nations CSD was a critical organizational development which intervened in and influenced the development of these frameworks. Another early indicator framework for environment statistics—the Driving force-State-Response (DSR) framework—was developed under the aegis of Agenda 21 as a tool to systematize and represent the interrelationships encompassed by sustainable development. The DSR framework, which was derived from the PSR framework, was arranged according to the Agenda 21 chapters. Indicators were classified based on their “driving force”, “state” and “response” characteristics, where Driving force represented human activities, processes or patterns that impact on sustainable development; State indicators provide information on the condition of sustainable development; and Response indicators represented societal actions aimed at moving towards sustainable development.

B.48. In practice, some countries found the DSR framework inadequate for the social, economic and institutional dimensions of sustainable development because of the length of the suggested working list of indicators and the unavailability of some national indicator sets. Furthermore, the SDIs, organized in the economic, social and environment sections, do not facilitate their needed integration. Thus, they do not present a cohesive picture but rather a series of separate lists. Consequently, the use of the DSR framework was discontinued within the CSD work on SDIs.

B.49. As a successor approach, in 2001, the CSD published its “Indicators of Sustainable Development: Guidelines and Methodologies”, codifying the output of its work programme on indicators of sustainable development. This publication provided a detailed description of key sustainable development themes and subthemes, proposing a framework and core set of indicators. The framework offered 15 themes and 38 subthemes to guide national indicator development beyond 2001. Even though this organization was not done strictly along Agenda 21 chapters, its strength was that it managed to better satisfy its original intent by putting more emphasis on policy-oriented topics.

B.50. More recently, in 2007, a non-linear matrix-type of structure was adopted by the CSD, where each indicator could be relevant for different dimensions and themes of sustainable development. The division of indicators along the lines of four pillars (social, economic, environmental and institutional) is no longer explicit in the newly revised core set of SDIs. This change emphasizes the multidimensional nature of sustainable development and reflects the importance of integrating its pillars. Consequently, new cross-cutting themes, such as poverty and natural hazards, were introduced and existing cross-cutting themes, such as consumption and production patterns, are better represented.

B.51. The DPSIR framework is yet another framework that attempts to organize environmental components in logical fashion according to components of driving force, pressure, state, impact and response.¹⁴⁸

B.52. Here, Driving force refers to the social, demographic and economic developments in a society and the corresponding changes in lifestyles and overall levels of consumption and production patterns. The major driving forces are population growth and changes in individuals’ needs and activities. They provoke changes in overall levels of production and consumption and, thereby, exert pressure on the environment. This pressure may manifest itself in various ways, including excessive use of natural resources, changes in land use and emissions (of chemicals, waste, radiation and noise) to air, water and land. The Pressure component provides information on emissions, application of chemical and biological agents and the use of land and other resources. The pressures exerted by society’s production and consumption patterns

¹⁴⁸ European Environment Agency (2003), *Environmental Indicators: Typology and Use in Reporting*, Chapter 3.1, available from http://www.iwrms.uni-jena.de/fileadmin/Geoinformatik/projekte/brahmatwinn/Workshops/FEEM/Indicators/EEA_Working_paper_DPSIR.pdf (accessed 4 August 2017)

are subsequently transformed via natural processes that may result in changes in the state of the environment. The State component provides information on the level, quality and/or quantity of physical phenomena, biological phenomena and chemical phenomena in a given area at a given point in time. Changes in the state of the environment may have environmental and economic impacts on ecosystems and, eventually, on human health and the economic and social welfare of a society. The Impact component describes the relevance of changes in the state of the environment and the corresponding implications for ecosystems, the economy and human well-being and health. Response refers to the reaction of the government, institutions, groups of people and individuals to undesired impacts on the environment in order to prevent, mitigate, ameliorate or adapt to changes in the environment. For example, responses may seek to change and/or redirect prevailing trends in the consumption and production of goods and services, improve the monitoring and control of pollutants or develop cleaner technologies.

B.53. The Global (regional, national) Environment Outlooks (GEOs), led by UNEP, are produced using the DPSIR framework for analysis. This process involves stakeholders and collaborating academic and research centres, which perform the assessment based on a documented methodology. In general, the core indicators data matrix is organized using a theme-issue row structure. The main themes include land, forest, biodiversity, freshwater, atmosphere, coastal and marine areas, disasters and urban areas.

B.54. The evolution of these frameworks and their sequences has influenced the production of environmental statistics and indicators over the years at the global and national levels. Their contents, structure and conceptual underpinning, and the experiences of practitioners working with them in real life, have been analysed and have contributed to the revision of the FDES, particularly to the shape of its new structure and the scope of its contents.

System of Environmental-Economic Accounting (SEEA)

B.55. In 1987, the report of the Brundtland Commission, *Our Common Future*, made clear the links between economic and social development and the environment's capacity. Shortly afterwards, in 1992, the recommendations of the UN Conference on Environment and Development "Earth Summit" in Agenda 21 (UN 1992)¹⁴⁹ recommended that countries implement environmental-economic accounts at the earliest date.

B.56. In response, the UNSD published the handbook of national accounting—*Integrated Environmental and Economic Accounting* (UN 1993),¹⁵⁰ commonly referred to as the SEEA. This handbook was issued as an "interim" version of work in progress since the discussion of relevant concepts and methods had not come to a final conclusion.

B.57. As a result of the publication of the SEEA handbook, several developing and developed countries started experimenting on the compilation of SEEA-based data. The London Group on Environmental Accounting was created in 1994 under the auspices of the United Nations Statistical Commission to provide a forum for practitioners to share their experiences on developing and implementing environmental-economic accounts. Increased discussions on concepts and methods of environmental-economic accounting, accompanied with country experiences led to an increasing convergence of concepts and methods for various modules of the SEEA.

B.58. *Integrated Environmental and Economic Accounting—An Operational Manual* (UN 2000)¹⁵¹ was published by UNSD and UNEP based on material prepared by the Nairobi group, a group of experts established in 1995 from national and international agencies and NGOs. This publication reflected the ongoing discussion following the publication of the SEEA in 1993 and provided step-by-step guidance on the implementation of the more practical modules of

¹⁴⁹ United Nations "Agenda 21", United Nations Conference on Environment and Development, Rio de Janeiro, Brazil, 3-14 June 1992, available from <http://sustainabledevelopment.un.org/content/documents/Agenda21.pdf> (accessed 4 August 2017).

¹⁵⁰ United Nations Statistics Division (1993), *Integrated Environmental and Economic Accounting* (interim version), available from http://unstats.un.org/unsd/publication/SeriesF/SeriesF_61E.pdf (accessed 4 August 2017).

¹⁵¹ United Nations Statistics Division (2000). *Integrated Environmental and Economic Accounting—An Operational Manual*, available from http://unstats.un.org/unsd/publication/SeriesF/SeriesF_78E.pdf (accessed 4 August 2017).

the SEEA and elaborated the uses of integrated environmental and economic accounting in policymaking.

B.59. In parallel with this work, the international agencies, in cooperation with the London Group, worked on a revision of the 1993 SEEA. The revision process was carried out through a series of expert meetings and involved wide consultation. The revised SEEA, SEEA-2003, represented a significant step forward in terms of breadth of material and harmonization of concepts, definitions and methods in environmental and economic accounting. However, in several places, the SEEA-2003 presented multiple methodological options and a range of country examples, showing varying country practices. Thus, it was never formally adopted as an international statistical standard and the SEEA was not recognized as a statistical system in its own right. Nonetheless, the SEEA-2003 has provided a well-accepted and robust framework overall for compiling environmental and economic accounts. Many countries around the world have used it.

B.60. Recognizing the growing importance of information on the environment and the need to place it in an economic context that could be understood by central policymakers, the United Nations Statistical Commission agreed at its thirty-eighth session in February 2007 to begin a second revision process. This process was managed under the auspices of the United Nations Committee of Experts on Environmental and Economic Accounting (UNCEEA). There was substantial agreement on the content of the SEEA-2003 in terms of both scope and treatment, so the revision was to focus primarily on areas of the SEEA-2003 where additional understanding and agreement were needed. The London Group was assigned the 21 issues identified for the revision of the SEEA. The newly formed Oslo Group on Energy Statistics was also involved in the discussion of energy-related issues. The SEEA-CF represents the major outcome of the process.

B.61. During the revision process, it became clear that agreement was not likely to be reached on certain aspects of the SEEA-2003, specifically, measuring and valuing degradation. Consequently, the United Nations Statistical Commission determined that the revision of the SEEA should proceed to develop a Central Framework covering those issues where general international agreement existed and to develop material to address those aspects where agreement was not likely to be reached within the timeframes available and that required ongoing research and discussion.

B.62. Global consultation on the SEEA-CF was completed in 2011 and it was adopted by the United Nations Statistical Commission, at its forty-third session in 2012, as the “initial version of the international standard for environmental-economic accounts, subject to further revision, acknowledging that further improvements on measurement are necessary on specific issues.”¹⁵² The SEEA-CF was published in February 2014.¹⁵³

B.63. The SEEA-CF covers the interactions between the economy and the environment based on an accounting structure similar to that of the SNA and uses concepts, definitions and classifications consistent with the latter. As a satellite account of the central SNA, the SEEA-CF incorporates flows between the economy and the environment, and highlights environmental activities and expenditures that are not shown explicitly in conventional national accounts presentations. The SEEA-CF also incorporates environmental assets both inside and outside of the scope of conventional economic measurement, and records stocks of environmental assets and changes in these stocks over time.

B.64. The SEEA-CF is comprised of the following types of accounts: (i) supply and use tables in physical and monetary terms showing flows of natural inputs, products and residuals (ii) asset accounts for individual environmental assets in physical and monetary terms showing the stock of environmental assets at the beginning and end of each accounting period and the changes in the stock; (iii) a sequence of economic accounts showing all economic flows between

¹⁵² United Nations Statistical Commission (2012). Report on the Forty-Third Session, Economic and Social Council, *Official Records 2012*, Supplement No. 4, available from <http://unstats.un.org/unsd/statcom/sc2012.htm> (accessed 4 August 2017).

¹⁵³ United Nations, European Union, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development, and World Bank (2014), *System of Environmental-Economic Accounting 2012—Central Framework*, available from http://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf (accessed 4 August 2017).

economic units; and (iv) functional accounts which highlight economic activities undertaken for environmental purposes.

B.65. A second area of work complementing the SEEA-CF focuses on accounting for the environment from the ecosystem perspective, as presented in the SEEA, which is not an international standard. The publication¹⁵⁴ states that ecosystem accounting is a relatively new and emerging field dealing with integrating complex biophysical data, tracking changes in ecosystems and linking those changes to economic and other human activity. Ecosystem accounting is a coherent and integrated approach to the assessment of the environment through the measurement of ecosystems, and measurement of the flows of services from ecosystems into economic and other human activity. The scale of ecosystem accounting may vary from specific land cover types, such as forests, to larger integrated areas such as river basins, and includes areas that may be considered relatively natural and those that may be heavily influenced by human activity, such as agricultural areas.¹⁵⁵ Ecosystem accounting extends beyond other approaches to ecosystem analysis and assessment through the explicit linking of ecosystems to economic and other human activity.

B.66. During the revision process, a need also emerged for material covering potential extensions and applications of SEEA-based datasets, with the aim of promoting and supporting the widespread adoption of the SEEA among official statisticians, researchers and policymakers. To this end, the SEEA Applications and Extensions has been developed.¹⁵⁶ SEEA Applications and Extensions provides potential compilers and users of SEEA-based environmental-economic accounts with material to show how this information can be used in decision-making, policy review and formulation, analysis and research. SEEA Applications and Extensions is intended to provide a bridge between compilers and analysts allowing each to recognize the potential uses and the related measurement considerations. SEEA Applications and Extensions is a summary of the most common applications and extensions and does not provide complete coverage of all materials that may be relevant in the communication and dissemination of information on environmental-economic accounts. Since it is a summary guide to the use of SEEA-based data, SEEA Applications and Extensions is not a statistical standard. The choice of topics and examples is intended to provide an indication of the possibilities and does not represent a basis for standardised reporting at national or international level.

B.67. During the almost two decades of its evolution, the physical accounts have become more important in the development of the SEEA; therefore, the SEEA has become one of the major users and uses of environment statistics. The methodological work carried out during the process of the revision of the SEEA has produced concepts, definitions and classifications that are also relevant for and have been taken into consideration in the revision of the FDES.

¹⁵⁴ European Commission, Organisation for Economic Co-operation and Development, United Nations and World Bank (2014), *System of Environmental-Economic Accounting 2012: Experimental Ecosystem Accounting*, available from https://unstats.un.org/unsd/envaccounting/seeaRev/ae_final_en.pdf (accessed 4 August 2017).

¹⁵⁵ Ibid, page 1.

¹⁵⁶ European Commission, Food and Agriculture Organization of the United Nations, Organisation for Economic Co-operation and Development, United Nations and World Bank (2017). *System of Environmental-Economic Accounting 2012: Applications and Extensions*. Available from https://unstats.un.org/unsd/envaccounting/seeaRev/ae_final_en.pdf (accessed 4 August 2017).

Annex C

Multilateral Environmental Agreements (MEAs)

C.1. MEAs address, via international cooperation, environmental problems, especially those which have a transboundary nature or are global in scope. This Annex presents the most relevant global MEAs as they relate to the field of environment statistics, presented in alphabetical order. Most environmental problems have a transboundary nature and often a global scope, and can only be addressed effectively through international cooperation. Therefore, it is of utmost importance to promote measures at international level to deal with regional or worldwide environmental problems, and in particular combat climate change.¹⁵⁷

C.2. A summary of each of the selected MEAs is provided, followed by a description of its implications in terms of potential demand for data and statistics. For the most relevant MEAs, participant or signatory countries are usually expected to report on progress periodically, either on a mandatory or voluntary basis.

Basel Convention

C.3. In the late 1980s, enforcement of environmental regulations in industrialized countries increased. Consequently, so did pressure to find environmentally responsible means of disposing of hazardous waste. This was a major impetus for drafting and adopting the Basel Convention.¹⁵⁸

C.4. During its first decade (1989-1999), the Basel Convention was devoted mainly to setting up a framework to control the transboundary movements of hazardous wastes across international borders. It also developed criteria for “environmentally sound management (ESM)” of such wastes and established a Control System, based on prior written notification. In the 2000-2010 decade, the focus shifted from remedial to preventive aspects, with the following areas of concern recognized explicitly:

- i. Prevention, minimization, recycling, recovery and disposal of hazardous and other wastes, taking into account social, technological and economic concerns;
- ii. Active promotion and use of cleaner technologies and production methods;
- iii. Further reduction of movement of hazardous and other wastes;
- iv. Prevention and monitoring of illegal traffic;
- v. Improvement of institutional and technical capabilities—through technology when appropriate—especially for developing countries and countries with economies in transition;
- vi. Further development of regional centres for training and technology transfer;
- vii. Enhancement of information exchange, education and awareness-raising in all sectors of society; and
- viii. Cooperation and partnership with the public authorities, international organizations, the industry sector, non-governmental organizations and academic institutions.

¹⁵⁷ European Commission, “Environment—International Issues, Multilateral Environment Agreements”, available from http://ec.europa.eu/environment/international_issues/agreements_en.htm (accessed 4 August 2017).

¹⁵⁸ Basel Convention. Available from www.basel.int (accessed 4 August 2017).

C.5. The Convention requires all Parties to submit information regarding wastes through annual reports to the Secretariat in a questionnaire format, covering the status of information in Part 1 and annual reporting in Part 2. To facilitate national reporting, the Secretariat has developed the Electronic Reporting System of the Basel Convention.¹⁵⁹ A data visualization tool was created to show, in an interactive way, data provided by the Parties to the Basel Convention on the generation and transboundary movements of hazardous wastes and other wastes.¹⁶⁰

¹⁵⁹ Basel Convention. Electronic Reporting System of the Basel Convention, available from www.basel.int/Countries/NationalReporting/ElectronicReportingSystem/tabid/3356/Default.aspx (accessed 4 August 2017).

¹⁶⁰ Basel Convention. Data Visualization Tool for the Basel Convention on the Generation, Export and Import of Hazardous Wastes and Other Wastes, available from www.basel.int/Countries/NationalReporting/DataVisualizationTool/tabid/3216/Default.aspx (accessed 4 August 2017).

¹⁶¹ Convention on Biological Diversity. History of the Convention, available from www.cbd.int/history/ (accessed 4 August 2017).

¹⁶² Convention on Biological Diversity. Background, available from <https://www.cbd.int/reports/national.shtml> (accessed 4 August 2017).

¹⁶³ Convention on Biological Diversity. Strategic Plan for Biodiversity 2011-2020, including Aichi Biodiversity Targets, available from www.cbd.int/sp/ (accessed 4 August 2017).

Convention on Biological Diversity (CBD)

C.6. The CBD entered into force on 29 December 1993.¹⁶¹ This Convention arose from a growing commitment, at the international level, to sustainable development. It represented a dramatic step forward in the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from the use of genetic resources. The Convention requires Parties to present reports to the Conference of the Parties on measures that they have taken for the implementation of the provisions of the Convention and their effectiveness in meeting the objectives of the Convention. Guidelines for the national reports and many resource materials for the preparation of these reports can be found on the Convention's website.¹⁶²

C.7. The Strategic Plan for Biodiversity 2011-2020 was adopted at the tenth meeting of the Conference of the Parties, held in 2010.¹⁶³ It consists of an overarching framework on biodiversity, which includes 20 Aichi Biodiversity Targets organized under five strategic goals:

- i. Address the underlying causes of biodiversity loss by mainstreaming biodiversity across government and society;
- ii. Reduce the direct pressures on biodiversity and promote sustainable use;
- iii. To improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity;
- iv. Enhance the benefits to all from biodiversity and ecosystem services; and
- v. Enhance implementation through participatory planning, knowledge management and capacity building.

The goals and targets comprise both aspirations for achievement at the global level and a flexible framework for the establishment of national or regional targets. The global biodiversity indicators developed and brought together by the Biodiversity Indicators Partnership (BIP) are the primary mechanism for monitoring progress towards the Strategic Plan and the Aichi Biodiversity Targets. In the first instance 17 of the 20 Aichi targets are covered by at least one of the BIP indicators. In the coming years the Partnership will endeavour to fill gaps and expand its set of indicators to ensure that a comprehensive framework of global indicators is available to monitor progress towards the suite of Aichi Biodiversity Targets.¹⁶⁴

¹⁶⁴ Biodiversity Indicators Partnership (2012), "The Indicators", available from www.bipindicators.net/globalindicators (accessed 4 August 2017).

Convention on Fishing and Conservation of the Living Resources of the High Seas

C.8. The Convention on Fishing and Conservation of the Living Resources of the High Seas is an agreement that was designed to solve the problems involved in the conservation of living resources of the high seas through international cooperation, considering that because of the development of modern technology, some of these resources are in danger of being overexploited. The summary of the provisions of the convention are¹⁶⁵: all States have a duty to adopt, or cooperate with other States in adopting, measures necessary for the conservation of the living resources of the high seas (art. 1). Such measures should be formulated with a view

¹⁶⁵ *United Nations Treaty Series*. Volume 559, p. 285, available from <https://treaties.un.org/doc/Publication/UNTS/Volume%20559/v559.pdf> (accessed 4 August 2017).

to securing a supply of food for human consumption (art. 2). Coastal States have special interests in the high seas adjacent to their territorial seas and may unilaterally adopt conservation measures for such areas which shall be valid for other States if there is an urgent need for such measures, and if the measures are based on scientific findings and do not discriminate against foreign fishermen (arts. 6 and 7). The convention was opened for signature on 29 April 1958 in Geneva and entered into force on 20 March 1966.¹⁶⁶ No indicators have been put forward to measure the performance of this treaty.

Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

C.9. CITES is an international agreement between governments.¹⁶⁷ Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival. The trade is diverse, ranging from live animals and plants to a vast array of wildlife products derived from them. Levels of exploitation of some animal and plant species are high and the trade in them, together with other factors, such as habitat loss, is capable of heavily depleting their populations and even bringing some species close to extinction. Many wildlife species in trade are not endangered, but the existence of an agreement to ensure the sustainability of the trade is important in order to safeguard these resources for the future. Because the trade in wild animals and plants crosses borders between countries, efforts to regulate it require international cooperation to safeguard certain species from over-exploitation. CITES provides varying degrees of protection to more than 30,000 species of animals and plants, whether or not they are traded as live specimens. CITES entered into force on 1 July 1975. Countries adopt their own domestic legislation to ensure that CITES is implemented at the national level. Parties to CITES are required to submit reporting on legislative, regulatory and administrative measures taken to enforce its provisions. National reporting is intended to be supportive of the monitoring of the following objectives of CITES:

- i. Ensure compliance with and implementation and enforcement of the Convention;
- ii. Secure the necessary financial resources and means for the operation and implementation of the Convention; and
- iii. Contribute to significantly reducing the rate of biodiversity loss by ensuring that CITES and other multilateral instruments and processes are coherent and mutually supportive.

C.10. Each Party shall prepare periodic reports on its implementation of this Convention and shall transmit to the Secretariat, including an annual report and a biennial report. The standard formats for these reports and guidelines for their preparation and submission may be found on the Convention's website.¹⁶⁸ CITES trade data are accessible via the CITES trade database on the CITES website.¹⁶⁹

Convention on the Conservation of Migratory Species of Wild Animals (CMS)

C.11. The CMS or Bonn Convention is an intergovernmental treaty that aims to conserve terrestrial, aquatic and avian migratory species throughout their range.¹⁷⁰ Concluded under the aegis of UNEP, it is concerned with the conservation of wildlife and habitats on a global scale. Its steadily growing membership includes Parties from Africa, Central and South America, Asia, Europe and Oceania.

C.12. CMS Parties strive towards strictly protecting these animals, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. Besides establishing obligations for each State joining the Convention,

¹⁶⁶ *United Nations Treaty Series*, Chapter XXI, Law of the Sea, Convention on Fishing and Conservation of the Living Resources of the High Seas, available from https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXI-3&chapter=21&lang=en (accessed 4 August 2017).

¹⁶⁷ Text of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, available from <https://cites.org/eng/disc/text.php> (accessed 4 August 2017).

¹⁶⁸ Convention on International Trade in Endangered Species of Wild Fauna and Flora (2011), "Guidelines for the preparation and submission of CITES annual reports", available from <https://cites.org/sites/default/files/eng/notif/2011/E019A.pdf> (accessed 4 August 2017).

¹⁶⁹ Convention on International Trade in Endangered Species of Wild Fauna and Flora, "CITES Trade Database", available from <https://cites.org/eng/disc/text.php> (accessed 4 August 2017).

¹⁷⁰ Convention on the Conservation of Migratory Species of Wild Animals, "About CMS", available from www.cms.int/en (accessed 4 August 2017).

CMS promotes concerted action among the Range States of many of these species. CMS acts as a framework Convention. The Agreements may range from legally binding treaties to less formal instruments, such as Memoranda of Understanding, and can be adapted to the requirements of particular regions. The development of models tailored according to the conservation needs throughout the migratory range is a unique capacity of CMS.

C.13. Submission of an annual report under specified guidelines is a requirement. This reporting covers imports, exports and re-exports of the animals covered under the Convention, including of manufactured products derived from those species. National Reports are the official documents by which countries report to the decision-making bodies of CMS and/or its instruments on the measures they have undertaken to implement the priorities of the instruments. National Reports provide an official record of national implementation of each instrument over time and collectively they draw the picture of the overall implementation of the instrument.¹⁷¹ The CMS Family Online Reporting System is available on the CMS website.

¹⁷¹ Convention on the Conservation of Migratory Species of Wild Animals, "National Reports", available from www.cms.int/en/documents/national-reports (accessed 4 August 2017).

Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention)

C.14. The Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area was signed in 1992 by Czechoslovakia, Denmark, Estonia, the European Community, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden.¹⁷² The Convention on the Protection of the Marine Environment of the Baltic Sea Area, 1992, entered into force on 17 January 2000.¹⁷³ The objective of this Convention was to establish a framework of regional cooperation in the Baltic Sea in order to reduce and prevent pollution in this region and promote the self-regeneration of its marine environment and preservation of its ecological balance. In accordance with the precautionary principle and the principles of the 'polluter pays' and sustainable management, the parties undertake to adopt legislative, administrative or other relevant measures to achieve this objective. In the Baltic Sea Action Plan, the Contracting Parties to the Helsinki Convention agreed to periodically evaluate whether the targets of the Action Plan have been met by using indicator based assessments. For this reason, HELCOM core indicators were introduced to regularly assess the status of the Baltic Sea marine environment against targets that reflect good environmental status.¹⁷⁴

¹⁷² European Union, Treaties Office Database, Convention on the Protection of the Marine Environment of the Baltic Sea Area, 1992, available from <http://ec.europa.eu/world/agreements/prepare/CreateTreatiesWorkspace/treatiesGeneralData.do?step=0&redirect=true&treatyId=543> (accessed 4 August 2017).

¹⁷³ Ibid.

¹⁷⁴ HELCOM, Baltic Sea Environment Proceedings No. 136, "HELCOM core indicators, Final report of the HELCOM CORESET project", available from <http://helcom.fi/Lists/Publications/BSEP136.pdf> (accessed 4 August 2017).

International Convention for the Prevention of Pollution from Ships (MARPOL)

C.15. The International Convention for the Prevention of Pollution from Ships (MARPOL) is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. The MARPOL Convention was adopted on 2 November 1973 at IMO.¹⁷⁵ The Protocol of 1978 was adopted in response to a spate of tanker accidents in 1976-1977.¹⁷⁶ MARPOL has been updated by amendments through the years.

C.16. The Convention includes regulations aimed at preventing and minimizing pollution from ships—both accidental pollution and that from routine operations—and currently includes six technical Annexes:¹⁷⁷ (i) Regulations for the Prevention of Pollution by Oil (entered into force 2 October 1983) covers prevention of pollution by oil from operational measures as well as from accidental discharges (ii) Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (entered into force 2 October 1983) details the discharge criteria and measures for the control of pollution by noxious liquid substances carried in bulk and no discharge of residues containing noxious substances is permitted within 12 miles of the nearest land; (ii) Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form (entered into force 1 July 1992) contains general requirements for

¹⁷⁵ International Maritime Organization, International Convention for the Prevention of Pollution from Ships (MARPOL), available from [www.imo.org/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-\(MARPOL\).aspx](http://www.imo.org/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx) (accessed 4 August 2017).

¹⁷⁶ Ibid.

¹⁷⁷ Ibid.

the issuing of detailed standards on packing, marking, labelling, documentation, stowage, quantity limitations, exceptions and notifications; (iv) Prevention of Pollution by Sewage from Ships (entered into force 27 September 2003) contains requirements to control pollution of the sea by sewage; the discharge of sewage into the sea is prohibited, except when the ship has in operation an approved sewage treatment plant or when the ship is discharging comminuted and disinfected sewage using an approved system at a distance of more than three nautical miles from the nearest land; (v) Prevention of Pollution by Garbage from Ships (entered into force 31 December 1988) deals with different types of garbage and specifies the distances from land and the manner in which they may be disposed of; the most important feature of the Annex is the complete ban imposed on the disposal into the sea of all forms of plastics; and (vi) Prevention of Air Pollution from Ships (entered into force 19 May 2005) sets limits on sulphur oxide and nitrogen oxide emissions from ship exhausts and prohibits deliberate emissions of ozone depleting substances; designated emission control areas set more stringent standards for SO_x, NO_x and particulate matter.

C.17. IMO performance indicators have been brought forward with the aim of achieving safe shipping, secure shipping, environmentally sound shipping, efficient shipping, sustainable shipping, adoption of the highest practicable standards, implementation of instruments and capacity-building.¹⁷⁸

Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade

C.18. The Rotterdam Convention is a multilateral treaty to promote shared responsibilities during the process of importation of hazardous chemicals.¹⁷⁹ Adopted in September 1998 in Rotterdam, this Convention promotes open exchange of information and calls on exporters of hazardous chemicals to use proper labelling, include directions on safe handling, and inform purchasers of any known restrictions or bans. It fosters shared responsibility and joint efforts of the Parties to the Convention in international trade in hazardous chemicals to protect human health and the environment. Signatory nations can decide whether to allow or ban the importation of chemicals listed in the treaty and exporting countries are obliged to make sure that producers within their jurisdiction comply. The Convention provides for procedures concerning: banned or severely restricted chemicals; severely hazardous pesticide formulations; obligations regarding the import and export of chemicals; and Parties' cooperation and information exchange.

C.19. The Convention requires all Parties to submit to the Secretariat, as soon as possible and in any event no later than nine months after the date of dispatch of a decision guidance document, their decision concerning the future import of a chemical listed under the Convention. The Secretariat has developed the following two options: an online import response form that guides users through each section and provides assistance in completing it such as pointing to further sources of information; and a Word version of the form and instructions.¹⁸⁰ A database of import responses may be found on the Convention website.¹⁸¹ According to the Convention, any exported chemical that is banned or severely restricted under the Convention must be accompanied by an export notification. The standard form for export notification may be found on the Secretariat website.¹⁸²

Stockholm Convention on Persistent Organic Pollutants (POPs)

C.20. The Stockholm Convention is an international environmental treaty, signed in 2001 and effective from May 2004, that aims to eliminate or restrict the production and use of

¹⁷⁸ International Maritime Organization, Council 105th Session, Agenda Item 3(a), Strategy and Planning, (a) Monitoring of performance—Review of data measured against the performance indicators, available from [www.imo.org/KnowledgeCentre/ShipsAndShipping/FactsAndFigures/Statisticalresources/Documents/IMO%20Performance%20indicators%20C_105-3\(a\)-1\[1\].pdf](http://www.imo.org/KnowledgeCentre/ShipsAndShipping/FactsAndFigures/Statisticalresources/Documents/IMO%20Performance%20indicators%20C_105-3(a)-1[1].pdf) (accessed 4 August 2017).

¹⁷⁹ Text of the Rotterdam Convention, available from www.pic.int/TheConvention/Overview/TextoftheConvention/tabid/1048/language/en-US/Default.aspx (accessed 4 August 2017).

¹⁸⁰ Rotterdam Convention (2010). "Form and Instructions", available from www.pic.int/Procedures/ImportResponses/FormandInstructions/tabid/1165/language/en-US/Default.aspx (accessed 4 August 2017).

¹⁸¹ Rotterdam Convention (2010), "Database of Import Responses", available from www.pic.int/Procedures/ImportResponses/Database/tabid/1370/language/en-US/Default.aspx (accessed 4 August 2017).

¹⁸² Rotterdam Convention (2010), "Form and Instructions", available from www.pic.int/Procedures/ExportNotifications/FormandInstructions/tabid/1365/language/en-US/Default.aspx (accessed 4 August 2017).

¹⁸³ Text of the Stockholm Convention on POPs, available from <http://chm.pops.int/Convention/ConventionText/tabid/2232/language/en-GB/Default.aspx> (accessed 4 August 2017).

¹⁸⁴ United Nations Environment Programme. *Persistent Organic Pollutants*, available from <http://drustage.unep.org/chemicalsandwaste/what-we-do/science-and-risk/persistent-organic-pollutants-pops> (accessed 4 August 2017).

¹⁸⁵ Stockholm Convention on POPs (2008), Electronic Reporting System, available from <http://chm.pops.int/Countries/Reporting/ElectronicReportingSystem/tabid/3669/Default.aspx> (accessed 4 August 2017).

¹⁸⁶ Stockholm Convention on POPs (2009). "Clearing-house mechanism for information exchange on persistent organic pollutants", available from <http://chm.pops.int/Portals/0/Repository/COP4/UNEP-POPS-COP4-19.English.PDF> (accessed 4 August 2017).

¹⁸⁷ United Nations Economic Commission for Europe, Introduction, About the UNECE Water Convention, available from www.unece.org/env/water/text/text.html (accessed 4 August 2017).

¹⁸⁸ United Nations Economic Commission for Europe, Water Convention, The UNECE Water Convention, Helsinki, 17 March 1992, available from www.unece.org/env/water.html (accessed 4 August 2017).

¹⁸⁹ United Nations Economic Commission for Europe, Water Convention, About the Convention, Implementation, available from www.unece.org/env/water/partnership/part.html (accessed 4 August 2017).

¹⁹⁰ Text of the Ramsar Convention, available from http://ramsar.rgis.ch/cda/en/ramsar-documents-texts-convention-on/main/ramsar/1-31-38%5E20671_4000_0___ (accessed 4 August 2017).

POPs.¹⁸³ POPs are a group of chemicals possessing the following characteristics: they are highly toxic to humans and wildlife (harmfulness), they can last for many years in the environment before degrading into less dangerous forms (persistence), they bio-accumulate in the food chain (bio-accumulation), and they are transported over large distances through air and water and can be found worldwide (long-range transport).¹⁸⁴ In 1995, the Governing Council of UNEP called for global action to be taken on POPs.

C.21. Parties to the Stockholm Convention have agreed to a process by which persistent toxic compounds can be reviewed and added to the Convention, if they meet certain criteria for persistence and transboundary threat. A first set of new chemicals to be added to the Convention was agreed in May 2009. Compliance is monitored through required national reporting by Parties under the Convention. Reporting information relates to the initial 12 pollutants and the nine additional new pollutants, as well as to listed chemicals. The Convention requires each Party to report on the measures it has taken to implement the provisions of the Convention, including statistical data on its total quantities of production, import and export of each chemical listed in the Annex A and Annex B of the Convention every four years. Parties may submit their national reports through the Stockholm Convention Electronic Reporting System available online.¹⁸⁵

C.22. In pursuing the goal of promoting synergies among the Rotterdam Convention, the Basel Convention and the Stockholm Convention, commitment has been made to the establishment of a clearing house mechanism that would service the monitoring and information needs of all three Conventions.¹⁸⁶ The intent is that these synergies would foster sound chemicals management of the relevant pollutants over their life cycles.

The Convention on the Protection and Use of Transboundary Watercourses

C.23. The Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Water Convention) was adopted in Helsinki in 1992 and entered into force in 1996.¹⁸⁷ Almost all countries sharing transboundary waters in the UNECE region are Parties to the Convention. The Water Convention strengthens transboundary water cooperation and measures for the ecologically-sound management and protection of transboundary surface waters and groundwater. The Convention fosters the implementation of IWRM, in particular the basin approach. The Convention's implementation contributes to the achievement of the MDGs and other international commitments on water, environment and sustainable development. The Water Convention requires Parties to prevent, control and reduce transboundary impacts, use transboundary waters in a reasonable and equitable way and ensure their sustainable management. Parties bordering the same transboundary waters have to cooperate by entering into specific agreements and establishing joint bodies.

C.24. As a framework agreement, the Convention does not replace bilateral and multilateral agreements for specific basins or aquifers; instead, it fosters their establishment and implementation, as well as further development. The areas of work of the convention include: quantifying benefits of transboundary water cooperation; water-energy-food-ecosystems nexus; assessment of transboundary waters; water and adaptation to climate change; and water and industrial accidents. In 2003, the Water Convention was amended to allow accession by countries outside the UNECE region. The amendment entered into force on 6 February 2013, turning the Water Convention into a global legal framework for transboundary water cooperation. It is expected that countries outside the UNECE region will be able to join the Convention as of late 2015.¹⁸⁸ No specific indicators associated to this convention have been found, but there is a guide for implementing this convention. The Guide offers a comprehensive commentary to the Convention's provisions, providing explanations of the procedural, legal, administrative, technical and practical aspects of the Convention's requirements for appropriate implementation.¹⁸⁹

The Convention on Wetlands of International Importance, especially as Waterfowl Habitat (the Ramsar Convention)

C.25. The Ramsar Convention is an international treaty for the conservation and sustainable utilisation of wetlands.¹⁹⁰ Signed in 1971, it is an intergovernmental treaty that provides a framework for national action and international cooperation. It encourages the “wise use” of wetlands and the maintenance of their “ecological character”.¹⁹¹ It is intended to stem the progressive encroachment on and loss of wetlands now and in the future, recognizing the fundamental ecological functions of wetlands and their economic, cultural, scientific, and recreational value. Parties are charged with identifying suitable wetlands for placement on the List of Wetlands of International Importance (also called “Ramsar Sites”). The Convention requests relevant international bodies to prepare reports and statistics on matters which are essentially international in character affecting wetlands. It urges Parties to submit detailed National Reports to the Secretariat at least six months before each ordinary meeting of the Conference, and this tradition has continued unbroken to this day.¹⁹² National reporting covers a well-developed set of indicators on the ecological character of sites, the conservation status of wetlands, bird populations, etc., that cover its effectiveness at different levels of implementation.¹⁹³

The International Treaty on Plant Genetic Resources for Food and Agriculture

C.26. The International Treaty on Plant Genetic Resources for Food and Agriculture aims at recognizing the enormous contribution of farmers to the diversity of crops that feed the world, establishing a global system to provide farmers, plant breeders and scientists with access to plant genetic materials, and ensuring that recipients share benefits they derive from the use of these genetic materials with the countries where they originated. The Treaty came into force on 29 June 2004¹⁹⁴ and is crucial in the fight against hunger and poverty and essential for the achievement of Millennium Development Goals 1 and 7.¹⁹⁵

C.27. No country is self-sufficient in plant genetic resources; all depend on genetic diversity in crops from other countries and regions. International cooperation and open exchange of genetic resources are therefore essential for food security. The fair sharing of benefits arising from the use of these resources has for the first time been practically implemented at the international level through the Treaty and its Standard Material Transfer Agreement. The treaty benefits: farmers and their communities, through Farmers’ Rights; consumers, because of a greater variety of foods, and of agriculture products, as well as increased food security; the xxGovernmental Conference on the Convention on the Dumping of Wastes at Sea, which met in London in November 1972 at the invitation of the United Kingdom, adopted the London Convention which came into force on 30 August 1975.¹⁹⁷ Since 1977, it has been administered by the International Maritime Organization (IMO).¹⁹⁸

The London Convention

C.28. The London Convention contributes to the international control and prevention of marine pollution by prohibiting the dumping of certain hazardous materials. In 1996, the Parties adopted a protocol which represents a major change of approach to the question of how to regulate the use of the sea as a depository for waste materials. Rather than stating which materials may not be dumped, it prohibits all dumping, except for possibly acceptable wastes on the so-called “reverse list”. This protocol entered into force in 2006.¹⁹⁹ It restricts all dumping except for a permitted list (which still require permits). The permitted substances are: dredged

¹⁹¹ The Ramsar Convention (2005), Resolutions on the 9th Meeting of the Conference of the Contracting Parties—Resolution IX.1 Annex A, available from http://ramsar.rgis.ch/cda/en/ramsar-documents-resol-resolution-ix-1-annex-a/main/ramsar/1-31-107%5E23536_4000_0 (accessed 4 August 2017).

¹⁹² The Ramsar Convention. National Reports, available from http://ramsar.rgis.ch/cda/en/ramsar-documents-natl-rpts-national-reports-cop12/main/ramsar/1-31-121-592_4000_0 (accessed 4 August 2017).

¹⁹³ International Expert Workshop on the 2010 Biodiversity Indicators and Post-2010 Indicator Development, available from www.cbd.int/doc/meetings/ind/emind-02/official/emind-02-08d-en.pdf (accessed 4 August 2017).

¹⁹⁴ The International Treaty on Plant Genetic Resources for Food and Agriculture. History: Evolution of the Treaty, available from www.planttreaty.org/content/history-evolution-treaty (accessed 4 August 2017).

¹⁹⁵ The International Treaty on Plant Genetic Resources for Food and Agriculture, The Importance of the International Treaty, available from www.planttreaty.org/ (accessed 4 August 2017).

¹⁹⁶ Food and Agriculture Organization of the United Nations (2012), Sixth Session of the Intergovernmental Technical Working Group on Plant Genetic Resources for Food and Agriculture, CGRFA/WG-PGR-6/12/2 Rev.1, Targets and indicators for plant genetic resources for food and agriculture, available from www.fao.org/fileadmin/templates/agphome/documents/PGR/ITWG/ITWG6/working_docs/CGRFA-WG-PGR-6.12.2_Rev.1.pdf (accessed 4 August 2017).

¹⁹⁷ International Maritime Organization. Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter. Available from www.imo.org/About/Conventions/ListOfConventions/Pages/Convention-on-the-Prevention-of-Marine-Pollution-by-Dumping-of-Wastes-and-Other-Matter.aspx (accessed 4 August 2017).

¹⁹⁸ Ibid.

¹⁹⁹ Ibid.

material; sewage sludge; fish waste or material resulting from industrial fish processing operations; vessels and platforms or other man-made structures at sea; inert, inorganic geological material; organic material of natural origin; bulky items primarily comprising iron, steel, concrete and similar non-harmful materials for which the concern is physical impact and limited to those circumstances, where such wastes are generated at locations, such as small islands with isolated communities, having no practicable access to disposal options other than dumping; and CO₂ streams from CO₂ capture processes (added under the amendments adopted in 2006, which entered into force in 2007).²⁰⁰

²⁰⁰ Ibid.

C.29. The London Protocol stresses a “precautionary approach”, which requires that “appropriate preventative measures are taken when there is reason to believe that wastes or other matter introduced into the marine environment are likely to cause harm even when there is no conclusive evidence to prove a causal relation between inputs and their effects”.²⁰¹ It also states that “the polluter should, in principle, bear the cost of pollution” and emphasizes that Contracting Parties should ensure that the Protocol should not simply result in pollution being transferred from one part of the environment to another.²⁰²

²⁰¹ Ibid.

²⁰² Ibid.

The World Heritage Convention

C.30. A United Nations Educational, Science and Cultural Organization (UNESCO) World Heritage Site is a place (such as a forest, mountain, lake, desert, monument, building, complex or city) that is listed by UNESCO as having special cultural or physical significance. The list is maintained by the international World Heritage Programme administered by the UNESCO World Heritage Committee, which is composed of 21 of the States Parties to the Convention. They are elected by their General Assembly.²⁰³

²⁰³ United Nations Educational, Scientific and Cultural Organization. World Heritage Convention, available from <http://whc.unesco.org/en/convention/> (accessed 4 August 2017).

C.31. The programme catalogues, names and monitors sites of outstanding cultural or natural importance to the common heritage of humanity. Under certain conditions, listed sites may obtain funds from the World Heritage Fund. The programme was founded with the Convention Concerning the Protection of World Cultural and Natural Heritage, which was adopted by the General Conference of UNESCO on 16 November 1972. As of September 2012, 190 States Parties have ratified the Convention. Periodic reporting is intended to provide information on general policy development, status of services provided, scientific and technical studies and research and other aspects relating to the protection, conservation and presentation of the cultural and natural heritage. The Periodic Reporting process provides an assessment of the application of the World Heritage Convention by the States Parties as well as information about the sites to record possible changes in the state of conservation of sites. The Periodic Reports, submitted by the States Parties themselves, are prepared on a regional basis and are examined by the World Heritage Committee on a pre-established schedule based on a six-year cycle. For each of them, regional periodic reporting strategies are developed to ensure full participation of States Parties, competent institutions and regional expertise. The final result of each regional strategy is a Regional State of the World Heritage Report.²⁰⁴

²⁰⁴ United Nations Educational, Scientific and Cultural Organization. World Heritage Convention. Periodic Reporting. Available from <http://whc.unesco.org/en/periodicreporting/> (accessed 4 August 2017).

The Nagoya Protocol

C.32. The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity is an international agreement which aims at sharing the benefits arising from the utilization of genetic resources in a fair and equitable way. The sharing of the benefits is to be achieved by providing appropriate access to genetic resources and appropriate transfer of relevant technologies, taking into account all rights to those resources and technologies, and by providing appropriate funding to contribute to the conservation of biological diversity and to the sustainable use of its components. It was adopted by the Conference of the Parties to the CBD at its tenth meeting on

29 October 2010 in Nagoya, Japan.²⁰⁵ Since adoption in 2010, 92 (48 per cent) CBD Parties have signed the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization.²⁰⁶ As of 26 September 2014, 53 Parties to the CBD have deposited their instruments of ratification, acceptance, approval or accession. The Nagoya Protocol will enter into force 90 days after the date of deposit of the 50th instrument of ratification, acceptance, approval or accession, thus on 12 October 2014.²⁰⁷

C.33. The Nagoya Protocol is important because it will create greater legal certainty and transparency for both providers and users of genetic resources by establishing more predictable conditions for access to genetic resources and by helping to ensure benefit-sharing when genetic resources leave the contracting party providing the genetic resources. By helping to ensure benefit-sharing, the Nagoya Protocol creates incentives to conserve and sustainably use genetic resources, and therefore enhances the contribution of biodiversity to development and human well-being. Aichi Biodiversity Target 16 states that by 2015, the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization shall be in force and operational, consistent with national legislation.²⁰⁸ The headline indicator (arising from the Convention on Biological Diversity) for this protocol is trends in access and equity of benefit sharing of genetic resources.²⁰⁹

²⁰⁵ Convention on Biological Diversity, Nagoya Protocol, About the Nagoya Protocol, available from www.cbd.int/abs/about/default.shtml (accessed 4 August 2017).

²⁰⁶ Biodiversity Indicators Partnership, Ratification Status of the Nagoya Protocol, available from www.bipindicators.net/NagoyaProtocolratification (accessed 4 August 2017).

²⁰⁷ *Ibid.*

²⁰⁸ *Ibid.*

²⁰⁹ *Ibid.*

The United Nations Convention on the Law of the Sea (UNCLOS)

C.34. The UNCLOS is the international agreement that resulted from the third United Nations Conference on the Law of the Sea (UNCLOS III), which took place from 1973 through 1982.²¹⁰ The Convention defines the rights and responsibilities of nations in their use of the world's oceans, establishing guidelines for businesses, the environment and the management of marine natural resources. The Convention was concluded in 1982 and replaced four 1958 treaties. One of its implementing agreements, relating to the seabed and ocean floor and their subsoils beyond the limits of national jurisdiction, came into force in 1996 and the other, relating to fish stocks, came into force in 2001.

C.35. Enforcement of the Convention is facilitated by organizations such as the IMO, the International Whaling Commission, and the International Seabed Authority (the last established by the UN Convention).

C.36. Aside from its provisions defining ocean boundaries, Article 145 of the Convention explicitly provides for protection of the marine environment. Other articles of the Convention relate to freedom of scientific research on the high seas and creation of a legal system for controlling the exploitation of mineral resources in deep seabed areas beyond national jurisdiction.²¹¹ Following are the fishery-related UNCLOS sustainability indicators which have been put forward by the FAO to monitor this Convention. The fishery-related indicators are:²¹²

- i. Yield-related indicators such as Catches, Catch value, Pelagic/Demersal ratio (P/D);
- ii. Capacity-related indicators such as Fishing effort, Fishing intensity;
- iii. Other economic indicators such as Investment, Level of subsidies;
- iv. Technological indicators such as Lists of acceptable gear;
- v. Social indicators such as Coastal populations and Ratio between fisheries and other revenues;
- vi. Institutional indicators such as Per cent of fisheries covered by management committees;
- vii. Ecosystem-related indicators such as Catch per unit of effort;
- viii. Resource demographic structure such as School size where relevant or Fat index;
- ix. Biological diversity such as Existence of protected marine areas;

²¹⁰ Text of the United Nations Convention on the Law of the Sea, available from www.un.org/Depts/los/convention_agreements/texts/unclos/unclos_e.pdf (accessed 4 August 2017).

²¹¹ *Ibid.*

²¹² Food and Agriculture Organization of the United Nations (1997), "Land quality indicators and their use in sustainable agriculture and rural development, Indicators of Sustainable Development of Fisheries", Appendix 2, available from www.fao.org/docrep/W4745E/w4745e0f.htm (accessed 4 August 2017).

- x. Water quality indicators such as Algae index or Release of nitrogen components and phosphates; and
- xi. Critical habitats indicators such as Area of live and dead coral.

United Nations Convention to Combat Desertification (UNCCD)

C.37. The UNCCD is a convention to combat desertification and mitigate the effects of drought through national action programmes that incorporate long-term strategies supported by international cooperation and partnership arrangements.²¹³

C.38. The Convention, stemming from a direct recommendation of Agenda 21, was adopted in Paris in June 1994 and entered into force in December 1996.²¹⁴ It is the first and only international legally binding framework set up to address the problem of desertification. The Convention is based on the principles of participation, partnership and decentralization—the backbone of good governance and sustainable development.

C.39. At the Conference of the Parties on its eighth session, the Parties to the Convention adopted the 10-year strategic plan and framework to enhance the implementation of the Convention for 2008-2018 (The Strategy).²¹⁵ The Strategy contains the “strategic objectives” to be achieved over the 10 years and the “operational objectives” that guide the actions of short and medium-term effects. Parties are requested to report on progress made with their implementation of The Strategy, while the Committee for the Review of the Convention is given the responsibility of reviewing its implementation based on the reports by Parties, as well as those from other reporting entities. Parties can use the online reporting platform: Performance Review and Assessment of Implementation System.²¹⁶

C.40. The core set of impact indicators used for monitoring purposes are:²¹⁷

- i. Decrease in the number of people negatively impacted by the process of desertification/land degradation and drought;
- ii. Increase in the proportion of households living above the poverty line in affected areas;
- iii. Reduction in the proportion of the population below the minimum level of dietary energy consumption in affected areas;
- iv. Reduction in the total area affected by desertification/land degradation and drought;
- v. Increases in net primary productivity in affected areas;
- vi. Increases in carbon stocks (soil and plant biomass) in affected areas; and
- vii. Areas of forest, agricultural and aquaculture ecosystems under sustainable management.

United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol

C.41. The UNFCCC has the goal of preventing dangerous human interference with the climate system. Its immediate objectives included beginning “to cooperatively consider what they could do to limit average global temperature increases and the resulting climate change, and to cope with whatever impacts were, by then, inevitable.”²¹⁸ A number of nations have approved in addition to the treaty, the Kyoto Protocol, which has more powerful (and legally binding) measures. The Kyoto Protocol, an international and legally binding agreement to reduce GHG

²¹³ Text of the United Nations Convention to Combat Desertification, available from www.unccd.int/en/about-the-convention/Pages/Text-overview.aspx (accessed 4 August 2017).

²¹⁴ United Nations “Agenda 21”, United Nations Conference on Environment and Development, Rio de Janeiro, Brazil, 3 to 14 June 1992, available from <http://sustainabledevelopment.un.org/content/documents/Agenda21.pdf> (accessed 4 August 2017).

²¹⁵ United Nations Convention to Combat Desertification, The Reporting Process and the UNCCD 10-Year Strategy, available from <http://www2.unccd.int/convention/unccd-reporting-process> (accessed 4 August 2017).

²¹⁶ United Nations Convention to Combat Desertification, Performance Review and Assessment of Implementation System (PRAIS), available from <http://prais.unccd.int/> (accessed 4 August 2017).

²¹⁷ United Nations Convention to Combat Desertification, Report of the Conference of the Parties on its ninth session September to October 2009 ICCD/COP(9)/18/Add.1, available from <http://archive.unccd.int/cop/officialdocs/cop9/pdf/18add1eng.pdf> (accessed 4 August 2017).

²¹⁸ United Nations Framework Convention on Climate Change. Essential Background, The Convention and the Protocol, available from http://unfccc.int/essential_background/items/6031.php (accessed 4 August 2017).

emissions worldwide, entered into force in February 2005. With regard to national reporting/monitoring, the UNFCCC invited the IPCC to produce the 2006 IPCC Guidelines for National Greenhouse Gas Inventories. These guidelines provide internationally agreed methodologies intended for use by countries to estimate GHG inventories to report to the UNFCCC. Reporting and review requirements under the Convention encompass the following elements:²¹⁹ national communications which are submitted by Annex I Parties every four to five years following decisions for each submission by the Conference of the Parties; and national GHG inventories which are reported annually by Annex I Parties following reporting guidelines agreed by the Conference of the Parties and methodology developed by the IPCC. GHG inventory data may also be found on the UNFCCC website.²²⁰

C.42. The GHG emission and removal estimates are divided into main sectors, which are groupings of related processes, sources and sinks:

- i. Energy
- ii. Industrial Processes and Product Use
- iii. Agriculture, Forestry and Other Land Use
- iv. Waste
- v. Other (e.g., indirect emissions from nitrogen deposition from non-agriculture sources)²²¹

The IPCC is a scientific body whose purpose is to review and assess the most recent scientific, technical and socioeconomic information produced worldwide relevant to the understanding of climate change, including response strategies.²²² It should be noted that it does not conduct any research nor does it monitor climate related data or parameters.

Vienna Convention for the Protection of the Ozone Layer/ Montreal Protocol on Substances that Deplete the Ozone Layer

C.43. The Vienna Convention was adopted in 1985 and entered into force on 22 September 1988. The Vienna Convention did not require countries to take concrete actions to control ODSs. Instead, in accordance with the provisions of the Convention, the countries of the world agreed to the Montreal Protocol on Substances that Deplete the Ozone Layer under the Convention to advance that goal.²²³ The chief aim of the Montreal Protocol on Substances that Deplete the Ozone Layer is to reduce and eventually eliminate the production and use of man-made ODSs (chlorofluorocarbons, hydrochlorofluorocarbons, halons, methyl chloroform, carbon tetrachloride, methyl bromide and others).²²⁴ By agreeing to the terms of the Montreal Protocol, signatory nations commit to take actions to protect the ozone layer, hoping in the long-term to reverse the damage that has been done by the use of ODSs. The Protocol requires all Parties to submit a detailed national ODS data report annually on the production, import and export of each of the controlled ODSs. The data reporting forms, instructions and definitions may be downloaded from the Ozone Secretariat website.²²⁵ Data on, inter alia, the consumption and production of ODSs may be accessed from the Ozone Secretariat website.²²⁶

C.44. Among the MDGs, Goal 7 (Ensure environmental sustainability, Target 7A—Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources) identifies the consumption of ODSs as one of its indicators on which reporting should be done.

²¹⁹ United Nations Framework Convention on Climate Change. National Reports, available from http://unfccc.int/national_reports/items/1408.php (accessed 4 August 2017).

²²⁰ United Nations Framework Convention on Climate Change. Greenhouse Gas Inventory Data. Available from http://unfccc.int/ghg_data/items/3800.php (accessed 4 August 2017).

²²¹ Intergovernmental Panel on Climate Change (2007). 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Introduction to the 2006 guidelines, available from <https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol1.html> Intergovernmental Panel on Climate Change. Organization, available from www.ipcc.ch/organization/organization.shtml (accessed 4 August 2017).

²²² Intergovernmental Panel on Climate Change. Organization, available from www.ipcc.ch/organization/organization.shtml (accessed 4 August 2017).

²²³ The Vienna Convention for the Protection of the Ozone Layer (2010-2011), available from <http://ozone.unep.org/en/treaties-and-decisions/vienna-convention-protection-ozone-layer> (accessed 4 August 2017).

²²⁴ The Montreal Protocol on Substances that Deplete the Ozone Layer (2000), available from <http://ozone.unep.org/pdfs/Montreal-Protocol2000.pdf> (accessed 4 August 2017).

²²⁵ United Nations Environment Programme. "Data Reporting and Tools" (2014), available from <http://ozone.unep.org/en/data-reporting/data-reporting-and-tools> (accessed 4 August 2017).

²²⁶ United Nations Environment Programme. "Data Access Centre" (2014), available from http://ozone.unep.org/en/ods_data_access_centre/ (accessed 4 August 2017).

Annex D

Classifications and environment statistics

D.1. This Annex provides supporting material for the most important and widely used classifications, categories and other groupings relevant to the field of environment statistics. None of these should be considered as mandatory for reporting purposes.

Classifications of land cover and land use

D.2. FAO and partner agencies, including UNEP and the EEA, have done considerable work in developing land cover and land use classifications. After a comprehensive global consultation process, a classification composed of 14 classes has been developed in the SEEA-CF.²²⁷ These 14 classes have been generated using the LCCS, version 3 approach, created by FAO, and thus provide a comprehensive set of land cover types, mutually exclusive and unambiguous, with clear boundaries and systematic definitions.

²²⁷ United Nations, European Union, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development, and the World Bank (2014). *System of Environmental-Economic Accounting 2012—Central Framework*, available from http://unstats.un.org/unsd/envaccounting/seeaRev/SEEA_CF_Final_en.pdf (accessed 4 August 2017).

Table D.1
Land Cover Classification based on FAO LCCS (*interim*)

1. Artificial surfaces (including urban and associated areas)
2. Herbaceous crops
3. Woody crops
4. Multiple or layered crops
5. Grassland
6. Tree covered areas
7. Mangroves
8. Shrub covered areas
9. Shrubs and/or herbaceous vegetation, aquatic or regularly flooded
10. Sparsely natural vegetated areas
11. Terrestrial barren land
12. Permanent snow and glaciers
13. Inland water bodies
14. Coastal water bodies and inter-tidal areas

D.3. A reference framework for the classification of land use is provided in the SEEA-CF²²⁸ as agreed after a comprehensive global consultation process. The development of the land use classification included in the SEEA-CF, led by FAO, has been based on practices already in use in major international and national land use databases adjusted to meet the different needs which have arisen during the global consultation process on this issue.

²²⁸ Ibid.

Table D.2
Classification of Land Use (*interim*)

1. Land					
1.1	Agriculture	1.1.1	Land under temporary crops	1.1.1.1	Cereals
				1.1.1.2	Vegetables and melons
				1.1.1.3	Temporary oilseed crops
				1.1.1.4	Root/tuber crops with high starch or inulin content
				1.1.1.5	Temporary spice crops
				1.1.1.6	Leguminous crops
				1.1.1.7	Sugar crops
				1.1.1.8	Other temporary crops
		1.1.2	Land under temporary meadows and pastures		
		1.1.3	Land with temporary fallow		
		1.1.4	Land under permanent crops	1.1.4.1	Fruit and nuts
				1.1.4.2	Permanent oilseed crops
				1.1.4.3	Beverage and permanent spice crops
				1.1.4.4	Other permanent crops
		1.1.5	Land under permanent meadows and pastures	1.1.5.1	Cultivated permanent meadows and pastures
				1.1.5.2	Naturally grown permanent meadows and pastures
		1.1.6	Agricultural land under protective cover		
1.2	Forestry	1.2.1	Forest land	1.2.1.1	Primary regenerated forest
				1.2.1.2	Other naturally regenerated forest
				1.2.1.3	Planted forest
		1.2.2	Other wooded land		
1.3	Land use for aquaculture	1.3.1	Land use for hatcheries		
		1.3.2	Managed grow-out sites on land		
1.4	Use of built up and related areas	1.4.1	Mining and quarrying		
		1.4.2	Construction		
		1.4.3	Manufacturing		
		1.4.4	Technical infrastructure		
		1.4.5	Transport and storage		
		1.4.6	Commercial, financial, and public services		
		1.4.7	Recreational facilities		
		1.4.8	Residential		
1.5	Land used for maintenance and restoration of environmental functions				
1.6	Other uses of land n.e.c.				
1.7	Land not in use				
2. Inland waters					
2.1	Inland waters used for aquaculture or holding facilities				
2.2	Inland waters used for maintenance and restoration of environmental functions				
2.3	Other uses of inland waters n.e.c.				
2.4	Inland waters not in use				
3. Coastal waters					
3.1	Coastal waters used for aquaculture or holding facilities				
3.2	Coastal waters used for maintenance and restoration of environmental functions				
3.3	Other uses of coastal waters n.e.c.				
3.4	Coastal waters not in use				
4. Exclusive Economic Zone (EEZ)					
4.1	EEZ areas used for aquaculture or holding facilities				
4.2	EEZ areas used for maintenance and restoration of environmental functions				
4.3	Other uses of EEZ areas n.e.c.				
4.4	EEZ areas not in use				

Classification of environmental activities

D.4. The CEPA has been in place since 2000, covering the classes of activities pertaining to environmental protection. Subsequent work to develop an overarching CEA that incorporates the SEPA and an interim listing of resource management activities has been undertaken. The CEA classification has been developed as part of the SEEA-CF.²²⁹

²²⁹ Ibid.

Table D.3
Classification of Environmental Activities

I. Environmental Protection		
1. Protection of ambient air and climate	1.1 Prevention of pollution through in-process modifications	1.1.1 for the protection of ambient air
		1.1.2 for the protection of climate and ozone layer
	1.2 Treatment of exhaust gases and ventilation air	1.2.1 for the protection of ambient air
		1.2.2 for the protection of climate and ozone layer
	1.3 Measurement, control, laboratories and the like	
	1.4 Other activities	
2. Wastewater management	2.1 Prevention of pollution through in-process modifications	
	2.2 Sewerage networks	
	2.3 Wastewater treatment	
	2.4 Treatment of cooling water	
	2.5 Measurement, control, laboratories and the like	
	2.6 Other wastewater management activities	
3. Waste management	3.1 Prevention of pollution through in-process modifications	
	3.2 Collection and transport	
	3.3 Treatment and disposal of hazardous waste	3.3.1 Thermal treatment
		3.3.2 Landfill
		3.3.3 Other treatment and disposal
	3.4 Treatment and disposal of non-hazardous waste	3.4.1 Incineration
		3.4.2 Landfill
		3.4.3 Other treatment and disposal
	3.5 Measurement, control, laboratories and the like	
	3.6 Other waste management activities	
4. Protection and remediation of soil, groundwater and surface water	4.1 Prevention of pollutant infiltration	
	4.2 Cleaning up of soil and water bodies	
	4.3 Protection of soil from erosion and other physical degradation	
	4.4 Prevention and remediation of soil salinity	
	4.5 Measurement, control, laboratories and the like	
	4.6 Other activities	
5. Noise and vibration abatement (excluding workplace protection)	5.1 Preventive in-process modifications at the source	5.1.1 Road and rail traffic
		5.1.2 Air traffic
		5.1.3 Industrial and other noise
	5.2 Construction of anti-noise/vibration facilities	5.2.1 Road and rail traffic
		5.2.2 Air traffic
		5.2.3 Industrial and other noise
	5.3 Measurement, control, laboratories and the like	
5.4 Other activities		
6. Protection of biodiversity and landscapes	6.1 Protection and rehabilitation of species and habitats	
	6.2 Protection of natural and semi-natural landscapes	
	6.3 Measurement, control, laboratories and the like	
	6.4 Other activities	
7. Protection against radiation (excluding external safety)	7.1 Protection of ambient media	
	7.2 Transport and treatment of high level radioactive waste	
	7.3 Measurement, control, laboratories and the like	
	7.4 Other activities	

Table D.3 (continued)

Classification of Environmental Activities

I. Environmental Protection		
8. Research and development for environmental protection	8.1 Protection of ambient air and climate	8.1.1 Protection of ambient air
		8.1.2 Protection of atmosphere and climate
	8.2 Protection of water	
	8.3 Waste	
	8.4 Protection of soil and groundwater	
	8.5 Abatement of noise and vibration	
	8.6 Protection of species and habitats	
	8.7 Protection against radiation	
	8.8 Other research on the environment	
9. Other environmental protection activities	9.1 General environmental administration and management	9.1.1 General administration, regulation and the like
		9.1.2 Environmental management
	9.2 Education, training and information	
	9.3 Activities leading to indivisible expenditure	
	9.4 Activities n.e.c.	
II. Resource management (interim)		
10. Management of mineral and energy resources	10.1 Reduction of the intake of mineral and energy resources	
	10.2 Reduction of minerals use through the reduction of scraps and the production and consumption of recycled materials and products and reduction of heat and energy losses and energy savings	
	10.3 Measurement, control, laboratories and the like related to mineral and energy resources	
	10.4 Other activities for the management of mineral and energy resources	
11. Management of timber resources	11.1 Reduction of the intake of timber resources	
	11.2 Reduction of the consumption of forest (wood and non- wood)-related products	
	11.3 Reforestation and afforestation	
	11.4 Forest fires	
	11.5 Measurement, control, laboratories and the like related to natural timber resources	
	11.6 Other activities for the management of timber resources	
12. Management of aquatic resources	12.1 Reduction of the intake of aquatic resources	
	12.2 Replenishment of aquatic resources stocks	
	12.3 Measurement, control, laboratories and the like related to aquatic resources	
	12.4 Other activities for the management of aquatic resources	
13. Management of other biological resources (excl. timber and aquatic resources)	13.1 Reduction of the intake of biological resources (excl. timber and aquatic resources)	
	13.2 Replenishment of biological resources stocks (excl. timber and aquatic resources)	
	13.3 Measurement, control, laboratories and the like related to biological resources stocks (excl. timber and aquatic resources)	
	13.4 Other activities for the management of biological resources (excl. timber and aquatic resources)	
14. Management of water resources	14.1 Reduction of the intake of water resources	
	14.2 Reduction of water losses and leaks, water reuse and savings	
	14.3 Replenishment of water resources	
	14.4 Measurement, control, laboratories and the like related to water resources	
	14.5 Other activities for the management of water resources	
15. Research and development activities for resource management	15.1 Mineral and energy resources	
	15.2 Timber resources	
	15.3 Aquatic resources	
	15.4 Other biological resources	
	15.5 Water resources	
	15.6 Other R&D activities for natural resource management	
16. Other resource management activities	16.1 General administration of natural resources	16.1.1 General administration, regulation and the like
		16.1.2 Environmental management
	16.2 Education, training and information	
	16.3 Activities leading to indivisible expenditure	
	16.4 Activities n.e.c.	

D.5. Environment statistics classifications developed and adopted by the Statistical Division of the UNECE between 1989 and 1996 have been used extensively for international data collection. The UNECE environment statistics classifications are heterogeneous and are not pure classifications in the traditional sense; most of them include more than one single hierarchical classification. They also include recommendations for definitions, measurement methods and tabulations. These classifications include:

- i. UNECE Standard Statistical Classification of Water Use (1989);
- ii. UNECE Standard Statistical Classification of Marine Water Quality (1992)—See Table D.4;
- iii. UNECE Standard Statistical Classification of Surface Freshwater Quality for the Maintenance of Aquatic Life (1992)—See Table D.5;
- iv. UNECE Standard Statistical Classification of Land Use (1989);
- v. UNECE Standard Statistical Classification of Wastes (1989);
- vi. UNECE Standard Statistical Classification of Ambient Air Quality (1990)—See Table D.6;
- vii. UNECE Standard Statistical Classification of Flora, Fauna and Biotopes (1996); and
- viii. Single European Standard Statistical Classification of Environment Protection Activities and Facilities (1994).

Many of these classifications have been revised and taken over to be included in more recent classifications such as those on land cover, land use and environment protection activities (see Tables D.1-3). The following Tables 4-6 contain the UNECE classifications that are still in use in environment statistics and have global relevance.

Classification of marine water quality

Table D.4
UNECE Standard Statistical Classification of Marine Water Quality (1992)

Oxygen regime <i>Major criteria:</i> <i>Oxygen content in marine bottom waters</i>	<i>Class interpretation:</i> Class I: Excellent oxygen conditions for the maintenance of aquatic life. Class II: Good oxygen conditions for the maintenance of aquatic life. Class III: Slight oxygen deficiencies cause occasional formation of hydrogen sulphide. Class IV: Chronic deficiencies of oxygen and frequent occurrence of hydrogen sulphide impair reproduction and cause other sublethal chronic impacts to aquatic life. Class V: Frequent oxygen depletion leads to toxic levels of hydrogen sulphide with acute sublethal or lethal effects for aquatic life.
Eutrophication <i>Major criteria:</i> <i>Trophic state of marine surface water and the best available expert judgement regarding the impact of trophic state on aquatic life</i>	<i>Class interpretation:</i> Class I: Oligotrophic Class II: Mesotrophic Class III: Slightly eutrophic Class IV: Strongly eutrophic Class V: Hypertrophic
Pollution by harmful substances <i>Major criteria:</i> <i>Toxicological impact on aquatic life as established by US-EPA.</i>	<i>Class interpretation:</i> Class I: Approximate natural level or very low background contamination. Class II: [To be determined in accordance with the absence of observable effects ("no observable effects") on aquatic life.] Class III: [To be determined in accordance with occurrence of lowest observable effects on aquatic life, not exceeding threshold levels in species.] Class IV: Chronic toxicity Class V: Acute toxicity
Pollution by radioactivity <i>Major criteria:</i> [to be determined]	<i>Class interpretation:</i> [To be determined]

Classification of surface freshwater quality

Table D.5

UNECE Standard Statistical Classification of Surface Freshwater Quality for the Maintenance of Aquatic Life (1992)

<p>Oxygen regime <i>Oxygen content, together with presence of oxygen-demanding substances, and the impact of oxygen content levels on aquatic life</i></p>	<p><i>Class interpretation:</i> Class I: Constant near-saturation of oxygen content. Insignificant presence of oxygen demanding substances from the point of view of aquatic life. Class II: The oxygen saturation of water is good. Oxygen-demanding substances do not normally disturb oxygen saturation. Class III: Oxygen deficiencies may occur in the hypolimnion. The presence of oxygen-demanding substances risks sometimes considerable negative impacts on aquatic life through the reduction of oxygen content. Class IV: Oversaturation of oxygen or oxygen deficiency occur in the epilimnion and oxygen deficiencies are frequent in the hypolimnion, possibly owing to chronic problems with the presence of oxygen-demanding substances. Class V: Acute problems occur in oxygen regime, i.e. oversaturation or oxygen deficiency in the epilimnion, and oxygen deficiency leading to anaerobic conditions in the hypolimnion. The high level of presence of oxygen-demanding substances may equally cause acute oxygen deficiencies.</p>
<p>Eutrophication <i>Major criteria: Trophic state and best available expert judgement regarding the impact of trophic state on aquatic life, maintaining consistency between the three variables</i></p>	<p><i>Class interpretation:</i> Class I: Clear, oligotrophic water with, at most, a very slight, occasional anthropogenic pollution with organic matter. Low nutrient content, provides spawning grounds for salmonids. Class II: Slightly polluted, mesotrophic water receiving small discharges of organic matter. The loadings may lead to slightly increased primary productivity. Class III: Moderately eutrophic water receiving considerable amounts of discharges of organic matter and nutrients. The level of primary production is considerable and some changes in community structure, including fish species, can be observed. Class IV: Strongly eutrophic, polluted water, receiving discharges of organic matter, nutrients, and harmful substances. Algal blooms are common. Increased decomposition of organic matter together with stratification of water bodies may entail anaerobic conditions and fish kills. Mass occurrences of more tolerant species; populations of fish and benthic organisms are affected. Class V: Extensively polluted, hypertrophic water. Decomposers dominate over producers. Fish or benthic species do not occur permanently.</p>
<p>Acidification <i>Major criteria: Toxicological impact of acidity on aquatic life as established in US-EPA practices</i></p>	<p><i>Class interpretation:</i> Class I: The buffering capacity of the water is very good. Class II: The buffering capacity of the water is good. Class III: The buffering capacity is weak but keeps the acidity of the water at levels still suitable for most fish. Class IV: The buffering capacity is exceeded, leading to levels of acidity which affect the development of spawn. Class V: The water is without buffering capacity and its acidity is toxic for fish species.</p>
<p>Metals <i>Major criteria: Toxicological impact on aquatic life as established in US-EPA practices</i></p>	<p><i>Class interpretation:</i> Class I: No anthropogenic pollution with inorganic matter. Class II: Concentrations are below midpoint between natural and chronically toxic levels. Class III: Concentrations are above midpoint between natural and chronically toxic levels. Class IV: Excursions beyond chronic criteria concentrations occur, but do not establish chronically toxic conditions in terms of concentration levels, duration or frequency. Class V: Excursions beyond chronic criteria concentrations allow acutely toxic conditions in terms of concentration levels, duration or frequency.</p>
<p>Chlorinated micropollutants and other hazardous substances <i>Major criteria: Toxicological impact on aquatic life as established in US-EPA practices</i></p>	<p><i>Class interpretation:</i> Class I: Not applicable Class II: Not applicable Class III: Loadings are evident, but concentrations are below chronic and acute criteria levels. Class IV: Excursions beyond chronic criteria concentrations occur, but do not establish chronically toxic conditions in terms of concentration levels, duration or frequency. Class V: Excursions beyond chronic criteria concentrations allow acutely toxic conditions in terms of concentration levels, duration or frequency.</p>
<p>Radioactivity <i>Major criteria: Toxicological impact on aquatic life</i></p>	<p><i>Class interpretation:</i> [To be determined after experience is gained through data collection and interpretation.]</p>

Classification of ambient air quality

Table D.6
UNECE Standard Statistical Classification of Ambient Air Quality (1990)

Chemicals and their relevance in measurement estimation	E	CI	CB	G
1. Sulphur compounds				
1.1 Sulphur oxides (incl. emissions of hydrogen sulphide)	X	X	X	
1.2 Particulate sulphate			X	X
2. Oxidized nitrogen compounds and oxidants				
2.1 NO _x (excluding nitrous oxide)	X	X	X	
2.2 Nitric acid and particulate nitrate		X	X	X
2.3 Ozone –tropospheric			X	X
–stratospheric				X
2.4 Nitrous oxide (tropospheric)				X
3. Reduced nitrogen compounds				
3.1 Ammonia	X	X	X	
3.2 Particulate ammonium compounds		X	X	X
4. Inorganic carbon compounds				
4.1 Carbon monoxide	X	X		X
4.2 Carbon dioxide	X			X
5. Halogens and inorganic halogen compounds	X		X	
6. Volatile organic compounds (incl. halogenated compounds) ^a				
6.1 Methane	X			X
6.2 Non methane compounds				
6.2.1 Aldehydes	X	X	X	
6.2.2 CFCs	X			X
6.2.3 Halons	X			X
6.2.4 Other halogenated hydrocarbons	X			X
7. Heavy metals (to be specified)	X	X	X	
8. Suspended particulate matter	X	X	X	X
9. Chemical composition of precipitation water			X	X
Emissions [tons/year]				
1. Emissions from stationary sources				
1.1 By process				
1.1.1 Combustion of fuels				
1.1.1.1 In power plants				
1.1.1.2 In industrial establishments, excl. power plants				
1.1.1.3 In other economic activities and domestic heating				
1.1.2 Other processes, incl. evaporation				
1.1.2.1 In industrial sources				
1.1.2.2 In non-industrial and domestic sources				
1.2 By activity ^b				
1.2.1 Agricultural etc. (ISIC 01)				
1.2.2 Mining and quarrying (ISIC 10-14)				
1.2.3 Manufacture of paper and paper products (ISIC 21)				
1.2.4 Manufacture of coke oven products (ISIC 231)				

^a It may become possible to add relevant dioxins (toxic polychlorinated dibenzo dioxins and furans) as a separate group under this heading once sufficiently reliable emission and/or concentration data become available.

^b United Nations Statistics Division. *International Standard Industrial Classification of All Economic Activities, Rev. 3*, available from <http://unstats.un.org/unsd/cr/registry/regcst.asp?CI=2> (accessed 4 August 2017).

1.2.5	Manufacture of refined petroleum products (ISIC 232)
1.2.6	Manufacture of chemicals and chemical products (ISIC 24)
1.2.7	Manufacture of rubber and plastics products (ISIC 25)
1.2.8	Manufacture of other non metallic mineral products (ISIC/26)
1.2.9	Manufacture of basic iron and steel (ISIC 271)
1.2.10	Manufacture of basic precious and non ferrous metals (ISIC/272)
1.2.11	Electricity, gas, steam and hot water supply (ISIC 40)
1.2.12	Other economic activities
1.2.13	Households
1.3	By availability of cleaning
1.3.1	Without cleaning
1.3.2	With cleaning or equivalent device
2.	Emission from mobile sources
2.1	From road transport
2.1.1	Using motor spirit (gasoline)
2.1.2	Using gas (diesel) oil
2.1.3	Using other fuels
2.2	From railway transport
2.3	From other transport
2.4	From other mobile sources
Emissions should at this time be reported on the following materials:	
Sulphur oxides, incl. hydrogen sulphide [in units of SO ₂]	
NO _x , excl. nitrous oxide [in units of NO ₂]	
Ammonia	
Carbon monoxide	
Carbon dioxide [in units of CO ₂]	
Total volatile organic compounds, incl. halogenated compounds	
Lead	
Mercury	
Cadmium	
Suspended particulate matter	
Emission data on items 1.1.1.1 to 1.1.1.3 should be broken down by type of fuel as follows:	
Coal and coal products	
Products obtained from petroleum refineries	
Natural gas	
Other fuels	
Concentrations in ambient air	
2.1	Concentrations at impact stations
2.1.1	Sulphur oxides [expressed as SO ₂]
2.1.2	Nitrogen oxides [expressed as NO ₂]
2.1.3	Carbon monoxide
2.1.4	VOCs (to be specified)
2.1.5	Lead
2.1.6	Mercury
2.1.7	Cadmium
2.1.8	Suspended particulate matter

2.2	Concentrations at national/regional background stations
2.2.1	Sulphur oxides [expressed as SO ₂]
2.2.2	Particulate sulphate
2.2.3	Nitrogen oxides [expressed as NO ₂]
2.2.4	Nitric acid and particulate nitrate
2.2.5	Ozone (tropospheric)
2.2.6	Ammonia
2.2.7	Particulate ammonium compounds
2.2.8	VOCs (to be specified)
2.2.9	Chemical composition of precipitation (pH/H+ ammonium, nitrate, chloride and sulphate ions, sodium, potassium, magnesium and calcium ions, conductivity)
2.3	Concentrations at global background stations
2.3.1	Ozone (stratospheric)
2.3.2	Carbon dioxide
2.3.3	Methane
2.3.4	CFCs
2.3.5	Halons
2.3.6	Nitrous oxide
2.3.7	Suspended particulate matter

Depositions

3.1	Wet acidifying deposition
3.1.1	Sulphur dioxide and sulphate expressed in sulphur content
3.1.2	Nitrogen dioxide, nitric acid and nitrate expressed in nitrogen content
3.1.3	Ammonia and ammonium compounds expressed in nitrogen content
3.1.4	pH/H+

Note: Other deposition indicators may be added, once their development is sufficiently advanced.

Classification of disasters

D.6. The classifications to be used in the FDES to organize statistics on natural disasters are based on the CRED EM-DAT Database. The types of data to be registered in this component of environment statistics, at the most disaggregated variable level, may include, for each calendar year or other appropriate time frame:

Table D.7

Record for individual natural disaster occurrence

1. Identification	1.1	Name or denomination (if any)
	1.2	Location and course, spatial trajectory or occurrence
	1.3	Magnitude (scale)
	1.4	Date
	1.5	National declaration of disaster
	1.6	Maps and pictures—hyperlink
	1.7	Appeal for international assistance
2. Type of natural disaster	2.1	Disaster subgroup
	2.2	Disaster main type

Table D.8

CRED EM-DAT classification of disasters²³⁰

Disaster Subgroup	Disaster Main Type	Disaster Subtype
1 Geophysical	1.1 Earthquake	1.1.1 Ground shaking
		1.1.2 Tsunami
	1.2 Mass movement	
	1.3 Volcanic activity	1.3.1 Ash fall
		1.3.2 Lahar
		1.3.3 Pyroclastic flow
		1.3.4 Lava flow
2 Meteorological	2.1 Storm	2.1.1 Extra-tropical storm
		2.1.2 Tropical storm
		2.1.3 Convective storm
	2.2 Extreme temperature	2.2.1 Cold wave
		2.2.2 Heat wave
		2.2.3 Severe winter conditions
	2.3 Fog	
3 Hydrological	3.1 Flood	3.1.1 Coastal flood
		3.1.2 Riverine flood
		3.1.3 Flash flood
		3.1.4 Ice jam flood
	3.2 Landslide	3.2.1 Avalanche (snow, debris, mudflow, rockfall)
	3.3 Wave action	3.3.1 Rogue wave
		3.3.2 Seiche
4 Climatological	4.1 Drought	
	4.2 Glacial lake outburst	
	4.3 Wildfire	4.3.1 Forest fire
4.3.2 Land fire: brush, bush, pasture		
5 Biological	5.1 Epidemic	5.1.1 Viral disease
		5.1.2 Bacterial disease
		5.1.3 Parasitic disease
		5.1.4 Fungal disease
		5.1.5 Prion disease
	5.2 Insect infestation	5.2.1 Grasshopper
		5.2.2 Locust
	5.3 Animal accident	
6 Extraterrestrial	6.1 Impact	6.1.1 Airburst
	6.2 Space weather	6.2.1 Energetic particles
		6.2.2 Geomagnetic storm
		6.2.3 Shockwave

²³⁰ Centre for Research on the Epidemiology of Disasters EM-DAT. "Classification", available from www.emdat.be/classification (accessed 4 August 2017).

Classification of protected areas

²³¹ International Union for Conservation of Nature and Natural Resources, "IUCN Protected Areas Categories System", available from www.iucn.org/theme/protected-areas/about/categories (accessed 4 August 2017).

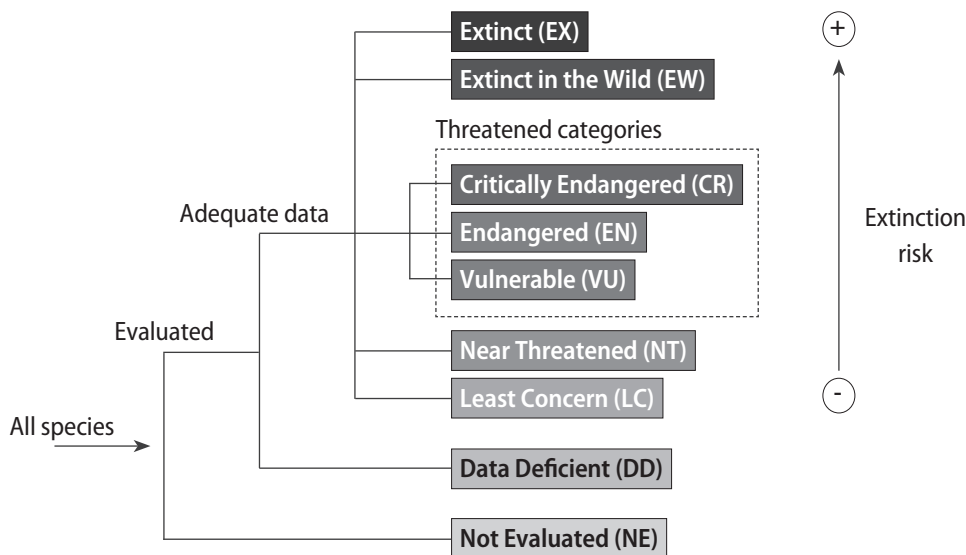
D.7. Through its World Commission on Protected Areas (WCPA), the IUCN has provided the international guidelines on the categorisation of protected areas for nearly a quarter of a century.²³¹ These categories are internationally recognized and facilitate a global system for defining, recording and classifying protected areas and the wide variety of specific aims they might embody. Acknowledged on an international level and often incorporated into national legislation, the categories below are based upon the management objectives of a protected area.

Table D.9
IUCN classification of protected areas

la: Strict Nature Reserve	Category Ia are strictly protected areas set aside to protect biodiversity and also possibly geological/geomorphological features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values. Such protected areas can serve as indispensable reference areas for scientific research and monitoring.
lb: Wilderness Area	Category Ib protected areas are usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, which are protected and managed so as to preserve their natural condition.
II: National Park	Category II protected areas are large natural or near-natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities.
III: Natural Monument or Feature	Category III protected areas are set aside to protect a specific natural monument, which can be a landform, sea mount, submarine cavern, geological feature such as a cave or even a living feature such as an ancient grove. They are generally quite small protected areas and often have high visitor value.
IV: Habitat/Species Management Area	Category IV protected areas aim to protect particular species or habitats and management reflects this priority. Many category IV protected areas will need regular, active interventions to address the requirements of particular species or to maintain habitats, but this is not a requirement of the category.
V: Protected Landscape/Seascape	A protected area where the interaction of people and nature over time has produced an area of distinct character with significant ecological, biological, cultural and scenic value: and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated nature conservation and other values.
VI: Protected area with sustainable use of natural resources	Category VI protected areas conserve ecosystems and habitats, together with associated cultural values and traditional natural resource management systems. They are generally large, with most of the area in a natural condition, where a proportion is under sustainable natural resource management and where low-level non-industrial use of natural resources compatible with nature conservation is seen as one of the main aims of the area.

D.8. The IUCN Red List Categories and Criteria are intended to be an easily and widely understood system for classifying species at high risk of global extinction. The general aim of the system is to provide an explicit, objective framework for the classification of the broadest range of species according to their extinction risk.²³²

Figure D.1
Structure of the IUCN Red List Categories²³³



²³² International Union for Conservation of Nature and Natural Resources, Species Survival Commission. "2001 IUCN Red List Categories and Criteria version 3.1", available from www.iucnredlist.org/technical-documents/categories-and-criteria/2001-categories-criteria (accessed 4 August 2017).

²³³ International Union for Conservation of Nature and Natural Resources, Species Survival Commission, "Guidelines for Using the IUCN Red List Categories and Criteria", Version 13 (March 2017), available from <http://cmsdocs.s3.amazonaws.com/RedListGuidelines.pdf> (accessed 4 August 2017).

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Glossary

Note to the user

This glossary aims to provide an easily accessible alphabetic list of selected terms used in the FDES. These terms originate in the FDES with particular or distinct attributes. They occur at different levels of complexity and provide context and supplementary information in diverse ways. The terms are presented here along with the paragraph numbers in which they appear in the text of the FDES.

Each term is accompanied by an explanation which may represent an actual definition or a simple description or may provide other relevant contextual information considered useful in furthering understanding.

For practical purposes, the original institutional references for the definitions of the terms are excluded from this list. However, in each instance they may be found in the original paragraph of the FDES cited at the end of the entry.

In some cases, terms which have been separated from their original context have a recontextualized explanation or supplemental content found in other paragraphs in order to enrich the explanation provided. The wording in this list may thus vary slightly from that used in the text of the FDES.

A

Afforestation is the establishment of forest through planting and/or deliberate seeding on land that, until then, was not classified as forest. It implies a transformation from non-forest to forest. From a resource accounting perspective, afforestation is defined by SEEA-CF as the increase in the stock of forest and other wooded land either due to the establishment of new forest on land that was previously not classified as forest land, or as a result of silvicultural measures such as planting and seeding. (paras. 3.109 and 3.119)

Agri-environmental indicators (AEI) are indicators able to describe and assess state and trends in the environmental performance of agriculture to furnish useful indications to scientists and policymakers about the state of the environment, about the effects of different policies, as well as about the efficiency in the use of budgets in terms of environmental outcomes. (para. 5.67 and 5.68)

Airborne diseases and conditions associated with the environment are caused or worsened by exposure to unhealthy levels of pollutants (such as PM, SO₂ or O₃), usually found in urban settlements and, in particular, in cities with weaker air quality regulations and/or enforcement capabilities. (para. 3.248)

Aquaculture is the farming of aquatic organisms, including fish, molluscs, crustaceans and aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators, etc. (para. 3.127)

Aquatic resources comprise fish, crustaceans, molluscs, shellfish, aquatic mammals and other aquatic organisms that are considered to live within the boundaries of the Exclusive Economic

Zone (EEZ) of a country throughout their life cycles, including both coastal and inland fisheries. Migrating and straddling fish stocks are considered to belong to a given country during the period when those stocks inhabit its EEZ. (para. 3.123)

B

Biodiversity is the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part, including diversity within species, between species and of ecosystems. It is also a measure of ecosystem health. (para. 3.23)

Biological resources are renewable resources that are capable of regeneration through natural (non-managed or managed) processes. Biological resources include timber and aquatic resources and a range of other animal and plant resources (such as livestock, orchards, crops and wild animals), fungi and bacteria. (para. 3.114)

Biome: A biome is a distinct community of plants, animals or fungi that occupy a distinct region. It is often referred to as an ecosystem. (para. 3.33)

Biota is defined as all animal and plant life of a particular region or time. Biotic (living) factors function with the abiotic (non-living) factors to form a complex unit such as an ecosystem. (para. 3.35)

C

Climate change is a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods. Climate change occurs through a chain of events and can be observable at all levels, from local to global. Climate process drivers are GHG emissions associated with current production and consumption patterns, which depend heavily on fossil fuels for energy and transportation. (paras. 5.26 and 5.30)

Climate change adaptation is an adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. (paras. 5.30 and 5.33)

Climate change evidence refers to the different processes that substantiate the occurrence of changing climate patterns at the global, regional and local levels. The evidence of global warming and climate change is unequivocal, including global temperature rise, extreme events, sea level rise, shrinking ice sheets and glacial retreat. (para. 5.30)

Climate change mitigation refers to efforts to reduce or prevent greenhouse gas emissions and may involve using new technologies, incorporating and increasing renewable energies, making older equipment more energy efficient and changing management practices or consumer behaviour. Protecting natural carbon sinks like forests and oceans, or creating new sinks through silviculture or green agriculture, are also elements of mitigation. (para. 5.31)

Climate change-related statistics (according to UNECE) refer to environmental, social and economic data that measure the human causes of climate change, the impacts of climate change on human and natural systems, and the efforts by humans to avoid and adapt to these consequences. (para. 5.35)

Corporate, non-profit institution and household environmental protection and resource management expenditure includes corporate, non-profit institution and household environmental expenditure whose primary aim is to protect the environment and manage its resources.

Statistics on this topic usually require the use of specific surveys of establishments in different sectors and industries. (para. 3.269)

Crops refer to plants or agricultural produce grown for food or other economic purposes, such as clothes or livestock fodder (ISIC Rev. 4, Section A, Division 01). (para. 3.131)

Cultivated biological resources cover animal resources yielding repeat products and tree, crop and plant resources yielding repeat products whose natural growth and regeneration are under the direct control, responsibility and management of an institutional unit. (para. 3.116)

D

Deforestation is the conversion of forest to another land use or the long-term reduction of the tree canopy cover below the minimum 10 per cent threshold. Deforestation implies the long-term or permanent loss of forest cover and implies transformation into another land use. Such a loss can only be caused and maintained by a continued human-induced or natural perturbation. Deforestation includes areas of forest converted to agriculture, pasture, water reservoirs and urban areas. The term specifically excludes areas where the trees have been removed as a result of harvesting or logging, and where the forest is expected to regenerate naturally or with the aid of silvicultural measures. From a resource accounting perspective, deforestation is defined by SEEA-CF as the decrease in the stock of forest and other wooded land due to the complete loss of tree cover and transfer of forest land to other uses (e.g., use as agricultural land, land under buildings, roads, etc.) or to no identifiable use. (paras. 3.109 and 3.119)

Depletion, in physical terms, is the decrease in the quantity of the stock of a natural resource over an accounting period that is due to the extraction of the natural resource by economic units occurring at a level greater than that of regeneration. (para. 3.78)

Disasters are unforeseen and often sudden events that cause great damage, destruction and human suffering. They often exceed local response capacities and require external assistance at the national or international level. A disaster is often described as a result of exposure to an extreme event. Depending on their cause, disasters can be both natural and technological. (para. 3.195)

Dissipative losses are material residues that are an indirect result of production and consumption activity. (para. 3.160)

Dissipative uses of products cover products that are deliberately released to the environment as part of production processes. (para. 3.159)

Driving Force-Pressure-State-Impact-Response (DPSIR) framework is an analytical framework that is based on the causal relationship between its D-P-S-I-R components. Driving forces are the socioeconomic and sociocultural forces driving human activities, which increase or mitigate pressures on the environment. Pressures are the stresses that human activities place on the environment. State, or state of the environment, is the condition of the environment. Impacts are the effects of environmental degradation. Responses refer to the responses by society to the environmental situation. (para. 2.41)

E

Economic territory is the area under the effective control of a single government. It includes the land area of a country, including islands, airspace, territorial waters and territorial enclaves in the rest of the world. Economic territory excludes territorial enclaves of other countries and international organizations located in the reference country. (para. 1.49)

Ecosystem is a dynamic complex of plant, animal and microorganism communities and their non-living environment interacting as a functional unit. (para. 2.8)

Ecosystem services are the benefits supplied by the functions of ecosystems and received by humanity. (para. 2.9)

Emissions are substances released to the environment by establishments and households as a result of production, consumption and accumulation processes. (para. 3.156)

Emissions to air are gaseous and particulate substances released to the atmosphere by establishments and households as a result of production, consumption and accumulation processes. (para. 3.164)

Emissions to water are substances released to water resources by establishments and households as a result of production, consumption and accumulation processes. (para. 3.179)

Energy production refers to the capture, extraction or manufacture of fuels or other energy products in forms which are ready for general consumption. Energy products are produced in a number of ways, depending on the energy source. Total energy production originates from sources that can be classified as non-renewable or renewable. (paras. 3.97 and 3.98) Energy production includes the production of primary and secondary energy. Primary energy refers to energy sources as found in their natural state, as opposed to derived or secondary energy, which is the result of the transformation of primary sources. (para. 3.99)

Environment statistics are environmental data that have been structured, synthesized and aggregated according to statistical methods, standards and procedures. The scope of environment statistics covers biophysical aspects of the environment and those aspects of the socioeconomic system that directly influence and interact with the environment. (paras. 1.26 and 1.33)

Environmental awareness involves the gradual understanding of environmental issues, and the recognition of the connections among human actions, development, sustainability and human responsibility in these processes. Environmental awareness involves the realization that humans and ecosystems co-exist in a shared environment, which is ultimately the biosphere. Awareness fosters pro-environmental attitudes and predispositions for action and changed behaviour. (para. 3.296)

Environmental data are large amounts of unprocessed observations and measurements about the environment and related processes. (para. 1.32)

Environmental education refers to the process of sharing and constructing environmental information and knowledge, as well as information on how humans interact with the environment. Environmental education is carried out through a variety of programmes, including formal and informal education and training, directed towards different audiences. It may be curriculum- and classroom-based or experiential, and may be provided on-site or in community settings by government agencies or NGOs. Environmental education is integral to education for sustainable development. (para. 3.292)

Environmental engagement involves the transformation of perceptions and attitudes into concrete, pro-environmental actions. Individual and social participation and engagement in environmental processes intended to improve and protect the local and global environment are a concrete manifestation of understanding and motivation of, and commitment to protecting and improving the environment, expressed through behaviour. (para. 3.300)

Environmental Goods and Services Sector (EGSS) consists of a heterogeneous set of producers of technologies, goods and services that (i) measure, control, restore, prevent, treat, minimize, research and sensitise environmental damages to air, water and soil as well as problems related to waste, noise, biodiversity and landscape (this includes “cleaner” technologies, goods and services that prevent or minimize pollution) and (ii) measure, control, restore, prevent, minimize,

research and sensitise resource depletion. This results mainly in resource-efficient technologies, goods and services that minimize the use of natural resources. (para. 3.266)

Environmental health focuses on how environmental factors and processes impact and change human health. It can be defined as an interdisciplinary field that focuses on analysing the relationship between public health and the environment. From the health perspective, WHO states that “environmental health addresses all the physical, chemical, and biological factors external to a person, and all the related factors impacting behaviours. It encompasses the assessment and control of those environmental factors that can potentially affect health. It is targeted towards preventing disease and creating health-supportive environments [...]”. (para. 3.242)

Environmental indicators are environment statistics that have been selected for their ability to depict important phenomena or dynamics. Environmental indicators are used to synthesize and present complex environment and other statistics in a simple, direct, clear and relevant way. (para. 1.34)

Environmental indices are composite or more complex measures that combine and synthesize more than one environmental indicator or statistic and are weighted according to different methods. (para. 1.35)

Environmental information includes quantitative and qualitative facts describing the state of the environment and its changes as described in the different components of the FDES. Quantitative environmental information is generally produced in the form of data, statistics and indicators, and is generally disseminated through databases, spreadsheets, compendiums and yearbooks. Qualitative environmental information consists of descriptions (e.g., textual or pictorial) of the environment or its constituent parts that cannot be adequately represented by accurate quantitative descriptors. Geographically referenced environmental information provides facts on the environment and its components using digital maps, satellite imagery and other sources linked to a location or map feature. (paras. 1.31 and 3.288)

Environmental perception refers to individuals’ and groups’ notions of, attitudes towards and evaluations of the environment, both as a whole or with respect to specific environmental issues. Individuals and communities make decisions and judgments, and take actions based on subjective perceptions of environmental information and experiences. Values and attitudes thus “filter” information and transform it into perception in a culturally specific manner. (para. 3.296)

Environmental protection activities are those activities whose primary purpose is the prevention, reduction and elimination of pollution and other forms of degradation of the environment. These activities include the protection of ambient air and climate, wastewater management, waste management, protection and remediation of soil, groundwater and surface water, noise and vibration abatement, protection of biodiversity and landscapes, protection against radiation, research and development for environmental protection and other environmental protection activities. (para. 3.262)

Environmental regulation and instruments refer to policy responses to regulate and establish acceptable limits for protecting the environment and human health. It entails both direct regulatory and economic instruments. Direct regulatory instruments include environmental and related laws, standards, limits and their enforcement capacities. These can be described using statistics on regulated pollutants, licensing systems, applications for licences, quotas for biological resource extraction, and budget and the number of staff dedicated to enforcement of environmental regulations. Economic instruments may comprise the existence and number of green/environmental taxes, environmental subsidies, eco-labelling and certification and emission permits. (para. 3.275)

Environmental resources (assets) are the naturally occurring living and non-living components of the Earth, together constituting the biophysical environment, which may provide benefits to humanity. Environmental resources include natural resources (such as sub-soil resources (mineral and energy), soil resources, biological resources and water resources) and land. They may be naturally renewable (e.g., fish, timber or water) or non-renewable (e.g., minerals). (para. 3.76)

Extreme events are events that are rare within their statistical reference distribution at a particular location. An extreme event is normally as rare as or rarer than the 10th or 90th percentile. (para. 3.195)

F

Fauna: The animal life of a particular region or time. It is generally regarded as that which is naturally occurring and indigenous. (para. 3.35)

Flora: The plant life of a particular region or time. It is generally regarded as that which is naturally occurring and indigenous. (para. 3.35)

Forest is land spanning more than 0.5 hectares with trees higher than 5 metres and a canopy cover of more than 10 per cent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use. (para. 3.42)

G

Genetic resources are defined as genetic material of plants, animals or microorganisms containing functional units of heredity that are of actual or potential value as a resource for future generations of humanity. (para. 3.133)

Geographic information system (GIS) is an integrating technology that helps to capture, manage, analyse, visualize and model a wide range of data with a spatial or locational component. (para. 1.51)

Geospatial information presents the location and characteristics of different attributes of the atmosphere, surface and sub-surface. It is used to describe, display and analyse data with discernible spatial aspects, such as land use, water resources and natural disasters. Geospatial information allows for the visual display of different statistics in a map-based layout, which can make it easier for users to work with and understand the data. The ability to overlay multiple data sets using software, for instance on population, environmental quality, and environmental health, allows for a deeper analysis of the relationship among these phenomena. (para. 1.50)

Government environmental protection and resource management expenditure includes government expenditure whose primary aim is to protect the environment and manage its resources. (para. 3.267)

Groundwater comprises water that collects in porous layers of underground formations known as aquifers. (para. 3.145)

H

Human settlements refer to the totality of the human community, whether people live in large cities, towns or villages. They encompass the human population that resides in a settlement, the physical elements (e.g., shelter and infrastructure), services (e.g., water, sanitation, waste removal, energy and transport), and the exposure of humans to potentially deleterious environmental conditions. (para. 3.218)

I

Improved drinking water source includes the use of: piped water into dwelling, plot or yard; public tap or standpipe; borehole or tube well; protected dug well; protected spring; rainwater collection and bottled water (if a secondary available source is also improved). (para. 3.226)

Improved sanitation facility is defined as one that hygienically separates human excreta from human contact. Improved facilities include flush/pour flush toilets or latrines connected to a sewer, -septic tank, or -pit, ventilated improved pit latrines, pit latrines with a slab or platform of any material which covers the pit entirely, except for the drop hole and composting toilets/latrines. (para. 3.227)

Institutional dimension of environment statistics refers to the institutional factors necessary to develop and strengthen the sustained production, dissemination and use of environment statistics. It comprises the legal framework that establishes the mandates and roles of the main partners, the institutional setting and institutional development level of environment statistics units, and the existence and effectiveness of inter-institutional cooperation and coordination mechanisms at the national level and with specialized international agencies. (para. 1.56)

Institutional strength: Government and citizen engagement in environmental and sustainable development public policy is reflected in the extent to which institutions that manage and regulate the environment exist and function properly at the national and subnational levels. (para. 3.273)

In-stream water use refers to the use of water without moving it from its source or to the use when water is immediately returned with little or no alteration. (para. 3.148)

K

Known mineral deposits include commercially recoverable deposits, potential commercially recoverable deposits and non-commercial and other known deposits. (para. 3.84)

L

Land provides space for natural ecosystems, human habitats and human activities. As this space is finite, the expansion of human activities can reduce the space occupied by natural ecosystems, thus reducing ecosystems' capacity to yield ecosystem goods and services for all living beings. From the resource perspective, land is a unique environmental resource that delineates the space in which economic activities and environmental processes take place and within which environmental resources and economic assets are located. (paras. 2.16 and 3.102)

Land cover is the observed (bio) physical cover on the earth's surface. (para. 3.23)

Land use reflects both the activities undertaken and the institutional arrangements put in place for a given area for the purposes of economic production, or the maintenance and restoration of environmental functions. Land being "used" means the existence of some kind of human activity or management. Consequently, there are areas of land that are "not in use" by human activities. (para. 3.104)

Livestock are animal species that are raised by humans for commercial purposes, consumption or labour (ISIC Rev. 4, Section A, Division 01). (para. 3.135)

M

Multilateral Environmental Agreements address, via international cooperation, environmental problems, especially those which have a transboundary nature or are global in scope. For the most relevant MEAs, participant or signatory countries are usually expected to report on progress periodically, either on a mandatory or voluntary basis. (paras. C.1 and C.2)

N

Natural biological resources consist of animals, birds, fish and plants that yield both once-only and repeat products for which natural growth and/or regeneration is not under the direct control, responsibility and management of institutional units. (para. 3.115)

Nuclear radiation-related diseases and conditions: The related diseases and health conditions may be acute or chronic. They include, but are not limited to, thermal burns from infrared heat radiation, beta and gamma burns from beta and gamma radiation, radiation sickness or “atomic disease”, leukaemia, lung cancer, thyroid cancer and cancer of other organs, sterility and congenital anomalies or malformations, premature aging, cataracts, and increased vulnerability to disease and emotional disorders. Exposure to nuclear radiation could occur from a nuclear explosion or an accident involving a nuclear reactor. (paras. 3.254 and 3.255)

O

Other non-cultivated biological resources: These resources may include wild berries, fungi, bacteria, fruits, sap and other plant resources that are harvested (ISIC Rev. 4, Section A, class 0230), as well as wild animals that are trapped or killed for production, consumption and trade (ISIC Rev. 4, Section A, class 0170). (para. 3.140)

Other wooded land is land not classified as “forest”, spanning more than 0.5 hectares; with trees higher than 5 metres and a canopy cover of 5-10 per cent, or trees able to reach these thresholds in situ; or with a combined cover of shrubs, bushes and trees above 10 per cent. It does not include land that is predominantly under agricultural or urban land use. (para. 3.42)

P

Protected Area Management Categories are based on the strictness of protection and serve as the classification for protected areas. The main categories are strict nature reserve; wilderness area; national park; natural monument or feature; habitat/species management area; protected landscape/seascape; and protected area with sustainable use of natural resources. (para. 3.38)

R

Remote sensing is the science of obtaining information about objects or areas from a distance, typically from aircraft or satellites. (para. 1.54)

Renewable energy is captured from sources that replenish themselves. It includes solar (photovoltaic and thermal), hydroelectric, geothermal, tidal action, wave action, marine (non-tidal currents, temperature differences and salinity gradients), wind and biomass energy, all of which are naturally replenished, although their flow may be limited. (para. 3.95)

Renewable water resources of a country are generated by precipitation and inflows of water from neighbouring territories and reduced by evapotranspiration. (para. 3.145)

Residuals are flows of solid, liquid and gaseous materials, and energy, that are discarded, discharged or emitted by establishments and households through processes of production, consumption or accumulation. (para. 3.154)

Resource management activities are those activities whose primary purpose is preserving and maintaining the stock of natural resources and hence safeguarding against depletion. These activities include, but are not limited to, reducing the withdrawals of natural resources (including through the recovery, reuse, recycling and substitution of natural resources); restoring natural resource stocks (increases or recharges of natural resource stocks); the general management of natural resources (including monitoring, control, surveillance and data collection); and the production of goods and services used to manage or conserve natural resources. They cover the management of mineral and energy resources; timber resources; aquatic resources; other biological resources; water resources; research and development activities for resource management; and other resource management activities. (para. 3.263)

Reused water is wastewater supplied to a user for further use with or without prior treatment. (para. 3.157)

S

Slums are housing lacking one or more of the following conditions: access to improved water; access to improved sanitation; sufficient living area; durability of housing; or security of tenure. (para. 3.235)

Soil provides the physical base to support the production and cycling of biological resources, provides the foundation for buildings and infrastructure, constitutes the source of nutrients and water for agriculture and forestry systems, provides a habitat for diverse organisms, plays an essential role in carbon sequestration and fulfils a complex buffering role against environmental variability, ranging from dampening diurnal and seasonal change in temperature and water supply to the storage and binding of a range of chemical and biological agents. The main environmental concerns about soil pertain to its degradation through soil erosion or nutrient depletion, among other processes. (para. 3.17)

Soil resources comprise the top layers (horizons) of soil that form a biological system. (para. 3.111)

Stocks of non-renewable energy resources are defined as the amount of known deposits of mineral energy resources. (para. 3.92)

Stocks of mineral resources are defined as the amount of known deposits of non-metallic and metallic mineral resources. (para. 3.84)

Subsoil resources are underground deposits of various minerals that provide raw materials and energy sources for humans. When considered as resources for human use, these subsoil elements differ fundamentally from ecosystems in that they are non-renewable. Their use thus results in permanent depletion. (para. 2.17)

Surface water comprises all water that flows over or is stored on the ground's surface, regardless of its salinity levels. Surface water includes water in artificial reservoirs, lakes, rivers and streams, snow, ice and glaciers. (para. 3.145)

T

Technological disasters may arise as a result of human intent, negligence or error, or from faulty or failed technological applications. The three types of technological disasters are: indus-

trial accidents which cover accidents associated with chemical spill, collapse, explosion, fire, gas leak, poisoning, radiation and other; transport accidents which cover accidents associated with air, road, rail, and water; and miscellaneous accidents which cover accidents associated with collapse, explosion, fire, and other disasters of varied origin. (paras. 3.205 and 3.206)

Timber resources are defined by the volume of trees, living and dead, which can still be used for timber or fuel. (para. 3.117)

Toxic substances include toxic pesticides (e.g., pesticides that have teratogenic, carcinogenic, tumorigenic and/or mutagenic effects), and toxic industrial chemicals (e.g., lead, arsenic, mercury and nickel, among others). (para. 3.252)

Toxic substance-related diseases and health problems include, but are not limited to, chronic illnesses of the respiratory system (such as pneumonia, upper and lower respiratory diseases, asthma and chronic obstructive pulmonary diseases), cancer, infertility, and congenital anomalies or malformations. (para. 3.252)

V

Vector-borne diseases are transmitted by organisms (e.g., insects and arachnids) that carry viruses, bacteria, protozoa and other pathogens. Common vector-borne diseases include, but are not limited to, malaria, dengue fever, yellow fever and Lyme disease. Some vector-borne diseases are directly affected by climate change, specifically by the change in rain patterns and floods. (para. 3.250)

W

Waste covers discarded materials that are no longer required by the owner or user. (para. 3.158)

Wastewater is discarded water that is no longer required by the owner or user. (para. 3.157)

Water abstraction is the amount of water that is removed from any source, either permanently or temporarily, in a given period of time. Water is abstracted from surface water and groundwater resources by economic activities and households. Water can be abstracted for own use or for distribution to other users. (para. 3.147)

Water-related diseases and conditions result from micro-organisms and chemicals in the water that humans drink. They include, but are not limited to, diseases caused by biological contamination, such as gastroenteritis infections caused by bacteria, viruses and protozoa, and water-borne parasite infections. (para. 3.249)

Water resources consist of freshwater and brackish water, regardless of their quality, in inland water bodies, including surface water, groundwater and soil water. (para. 3.145)

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