FIRST DRAFT

of

Environmental Statistics

Textbook

Munther Badriyah

TEXTBOOK DESCRIPTION

Title Introduction to Environmental Statistics

Prerequisites None

Overview

The introduction of Environmental statistics textbook is a reference for users interested in understanding and analysing these statistics, as well as to statisticians who are responsible for producing such statistics. The textbook looks into the methodologies supporting the statistical production process and into the facts and trends surrounding the various dimensions of equality in terms of environment in the context of the development process. It will familiarize a diversity of learners with a shared conceptual basis of environmental statistics. It may also be helpful for users from all sectors in order to gain an understanding of the complexity of the statistical process, and perhaps assist them to expressing more clearly their own needs.

The Learner must be known that the Environment Statistics is defined as the overall outer conditions affecting life, growth and beings existence. The environmental system is distinguished in the balance among its elements (i.e. water, air and land) and it can adapt, within certain limits, with changes that may occur. But, life development, technological advancement and introduction of machines, chemicals, radio-active items, various sources of power generation, exhaustion of natural resources, occurrence of catastrophes due to human activities such as nuclear explosions in addition to the use of fertilizers and pesticides, all these lead to environmental disequilibrium and many environmental problems.

So, environmental protection must be taken seriously in order to reduce these problems. It should be given top priority by the public and private sectors because each being has the right to live in a balanced, clean and pollution-free environment. The Learner must be known how to establish the environment statistics which is always keen to improve the work to provide comprehensive statistical data in this field. This helps the decision makers, policy makers, planners and researchers by using the available environmental database.

Required

Skills

The Learner must be familiar with main Environmental concepts and terminology as well as the basis of environment data analysis

LEARNING OBJECTIVES

To increase awareness how to:

A. Providing a statistical data on various environmental elements and their distribution in the country.

B. Providing of data on available natural resources, deposits and safe exploitation of these resources.

C. Providing of data on environmental pollutants by type, source and their effects on environment.

D. Providing for various environmental indicators.

E. Creating environmental database.

F. Providing of information on expenditure to protect the environment.

G. Providing for various environmental Account (Water Accounts)

CONTENT

The textbook will cover the following:

UNIT 1 – Environmental Statistics: an overview

1.1. Introduction

1.2. What are the environmental statistics

1.3. The importance of the environment in statistics

1.4. Intersection of environment with other related statistical divisions.

UNIT 2 – Environmental Statistics in the policy-making process

2.1. Environmental statistics from international perspective

2.2. Environmental statistics in the public and policy-making spheres

2.3. Integrating environment statistics in the policy- making process

2.4. The role of Ministry of Environment in the policy- making process

UNIT 3 – Environmental Statistics to improve national statistical systems

3.1. Making environmental statistics visible in statistics

3.2. The priority domains of environmental statistics

3.3. Data sources

3.4. Statistical production process

UNIT 4 – Presentation and dissemination of Environmental Statistics

4.1. Presentation of environmental statistics in graphs

4.2. Presentation of environmental statistics in tables

4.3. Dissemination- What it is and why it is important

4.4. Forms for disseminating environmental statistics

Annex 1- List of the minimum set of environment indicators.(United Nations)

RESOURCES

ESSENTIAL READING

- Developing Environment Statistics: A Practical Tool, and publication. (United Nations)
- The Environmental Statistics Manual, (United Nations).
- Concepts and Methods of Environmental Statistics of Natural Environment (United Nation)
- Integrated Assessment Tools and Methodologies for an Inclusive Green Economy in Africa
- introduction to statistical methods and data analysis
- Environmental Statistics Self-Assessment Tool

OTHER REFERENCES

The Environmental Statistics Manual (Department of Statistics – Jordan)

UNIT 1 – Environmental Statistics: an overview

1.1 Introduction

Environmental concerns have increasingly become the subject of mainstream polices. Sustainable development has been generally advocated as the best approach to integrating environmental concerns into national and international socio-economic development. Such integration needs to be supported by similarly integrated database. Environmental statistics are interdisciplinary in nature. Their sources are dispersed over a variety of data-collecting institutions, and a similar variety of methods are applied in their compilation. Environment statistics aim to overcome this heterogeneity by providing a synthetic presentation of data from various subject areas and sources. This is to assist in the formulation and evaluation of integrated socio-economic and environmental programs and policies. The scope of environment statistics includes the natural environment (air, climate, water, land), the biodiversity and human settlements (shelter and infrastructure and services). Within the broad range of subject areas, environment statistics describe the quality and availability of natural resources, human activities and natural events that affect the environment, the impact of these activities and natural responses to these impacts.

Environmental statistics are compiled by central statistical agencies, government institutions, specialized research centers, local authorities and international organizations. They are collected through censuses, surveys, the use of administrative records and monitoring networks. Many of the same institutions are major users of environment statistics. Further demand for environment statistics arises from business and industry, scientists, researcher and general public.

The interdisciplinary character of environment statistics and the variety of data producers and users call for comparative analysis of data availability and the coordination of data collection, processing and dissemination. Various national and international efforts have been made towards developing systems or frameworks for environmental statistics, either for planning programs of such statistics or by presenting available data in coherent statistical publications.

1.2 What are the environmental statistics

Environment statistics are statistics that describe the state and trends of the environment, covering the media of the natural environment (air/climate, water, land/soil), the biota within the media, and human settlements.

Environment statistics are integrative in nature, measuring human activities and natural events that affect the environment, the impacts of these activities and events, social responses to environmental impacts, and the quality and availability of natural assets. In addition to, include environmental indicators, indices and accounting.

The environmental statistics subject by definition is the development and application of statistical methodology to environmental issues- these can be based in the natural environment or the urban environment. Environmental statistics is a broad discipline stretching from how and what to sample, through to modeling impacts on human and ecosystem health and ultimately to providing predictions of what changes might occur in the future. Statistical methodology being used include time series analysis, spatial modeling, wavelet analysis, extreme value modeling and non-parametric (particularly regression and additive) modeling.

The environmental statistics consist of different categories: **Social, economic activities and natural events**. Human activities and natural events included under this category are those that may have a direct impact on the different components of the environment. Human activities consist mostly of the production and consumption of goods and services but could also include activities in pursuit of non-economic goals. They produce environmental impacts through the direct use or misuse of natural resources or through the generation of waste and emissions in production and ‘consumption processes. Natural events and disasters are also included in this information category because human activities frequently contribute to natural disasters and because natural events may have impacts on all environmental components.

Environmental impacts of activities: The statistical topics under this information category represent impacts of socio- economic activities and natural events. Responses to environmental impacts also affect the environment and, ultimately, human welfare. Environmental impacts, which may include the depletion or discovery of natural resources, changes in ambient concentrations of pollutants and deteriorating or improving living conditions in human settlements, can thus be either harmful or beneficial.

Responses to environmental impacts: Individuals, social groups, non-governmental organizations and public authorities respond to environmental impacts in different ways. Their responses are intended to prevent, control, counter, reverse or avoid negative impacts and to generate, promote or reinforce positive ones. Policies, programmes and projects designed to those ends include the monitoring and control of pollutants, the development

and application of environmentally sound technologies, changes in production and consumption patterns, management and sustainable use of natural resources, the prevention and mitigation of the effects of natural disasters and the improvement of living conditions in human settlements.

Stocks, inventories and background conditions: Statistical topics in this category are intended to provide *‘benchmark” data and to illustrate links with other subject areas for possible further statistical analysis of these relationships. They include the stocks of natural resources and of capital assets of human settlements and refer to environmental inventories, as well as to economic, demographic, meteorological or geographical background conditions. However, in view of the increasing interest in assessing interactions between environment and socio-economic development, a slightly different approach was taken in the present report: selected economic “background” statistics are now presented under the different statistical topics of the “activities” information category.

The categories with subjects as follows:

A. Social and economic activities & natural events (A)	Environmental impact of activities and events (B)	Response to environmental impact (C)	Stock and inventories (D)
1.Use of natural resources	**1.Resource depletion and increase**	**1.Resource management and rehabilitation**	**1.Biological Resources**
Agriculture	**Biological resources**	**Protection and conservation of nature**	**Agriculture stock**
Forestry	**Non-renewable resources**	**Management of natural resources**	**Forestry stock**
Hunting and trapping	**2.Environmental quality**	**Rehabilitation of degraded environment**	**Fisheries stock**
Fisheries	**Atmospheric pollution**	**2.Pollution monitoring and control**	**Fauna and flora inventories**
Mineral, Mining and quarrying	**Water Quality**	**Pollution research and surveillance**	**2. Non-renewable resources**
Energy production and consumption	**Soil and land quality**	**Standards, control and enforcement**	**Hydrological system**
Water use for human	**Quality of ecosystem**	**Environmental cleanup and rehabilitation**	**Climate**

activities			
Land use	**3.Human health and environmental disaster**	**Public pollution control facilities**	**Lithosphere**
2.Emission and waste loading in environment	**Human health and contamination**	**3.Prevention and hazard mitigation of natural disasters**	**Mineral resources**
Application of biochemical	**Impact of natural disasters**	**4.Private sector responses**	**3.Energy stock**
Natural events		**Enterprises**	**Renewable resources**
		Households	**Non-renewables**
			4.Ecosystem inventory

1.3 The importance of the environment in statistics

The main objectives of the Environmental Statistics:

- Collecting data on natural resources and pollutants
- Maintaining environmental database compatible with international standards and comparative with other countries
- Developing and improving environment sustainable indicators
- Integrating environment within economy by establishing environmental account

Environment is one of the main pillars in sustainable development. Integrating socio-economic development with environmental issues is the way to achievement of sustainability and economic success.

Environmental information includes quantitative and qualitative facts describing the state of the environment and its changes. Quantitative environmental information is generally produced in the form of data, statistics and indicators, and is generally disseminated through databases, spreadsheets, compendia 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.

Environmental data are large amounts of unprocessed observations and measurements about the environment and related processes. They may be collected or compiled via statistical surveys (censuses or sample surveys) by the national statistical system or may originate from administrative records, geographic databases, registers, inventories, monitoring networks, thematic mapping, remote sensing, scientific research and field studies.

Environment statistics are environmental data that have been structured, synthesized and aggregated according to statistical methods, standards and procedures. The role of environment statistics is to process environmental and other data into meaningful statistics that describe the state of and trends in the environment and the main processes affecting them. Not all environmental data are used to produce environment statistics. The FDES provides a framework that identifies environmental and other data that fall within its scope and then contributes to structuring, synthesizing and aggregating the data into statistical series and indicators.

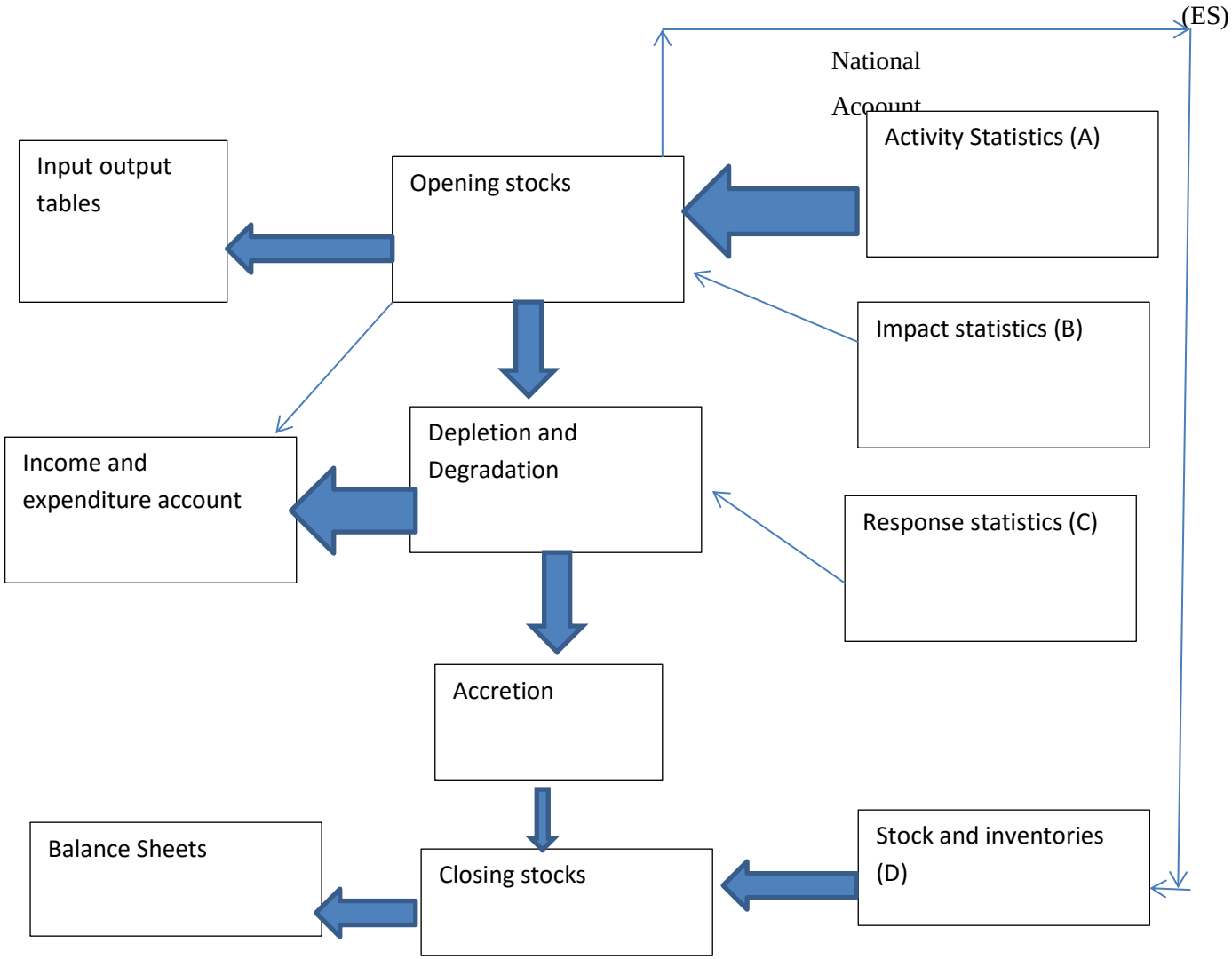
Environmental indicators are environment statistics that have been selected for their ability to depict important phenomena or dynamics. Environmental indicators are used to synthesize and present complex environment and other statistics in a simple, direct, clear and relevant way. Environmental indicators are generated because environment statistics are usually too numerous and detailed to meet the needs of policy makers and the general public, and often require further processing and interpretation to be meaningful. Environmental indicators may take various forms such as rates, ratios or proportions, and be constructed at different levels of aggregation. The purpose of these indicators is to assess present and future directions with respect to goals and targets, evaluate and determine the impact of specific programmes, monitor progress, measure changes in a specific condition or situation over time, and convey messages. Policy frameworks such as the Millennium Development Goal (MDG) and Sustainable Development Goal (SDG) frameworks, the Driving force – Pressure – State – Impact – Response (DPSIR) framework and national environment/sustainable development indicator sets, are typically used to identify and structure indicators.

1.4 Intersection of environment with other related statistical divisions.

There is intersection between environmental statistics and national account as follows:

Section (A) data of activity statistics give us information about extraction, section (B) data impact statistics will provide us with information about depletion and degradation. These 2 subjects will provide National account system about depletion and degradation of the resources and Input output tables.

Data linkage between environment statistics (ES) and system of national account (SNA)



Environmental statistics has a cross cutting issues between all statistical variables in all division such as:

- Population growth and Economic growth is the driving force for adverse impact on the environment.
- Natural resources such as water and energy are the determining factor for socio-economic development
- Environmental infrastructure such as waste dumping sites and wastewater treatment plants will adversely affecting the living and health conditions of people who are living in the neighbouring places.
- Agriculture statistics and livestock management types give a data base for agriculture waste disposal and management.
- Economic statistics data base is the core of expenditure on environment protection.

UNIT 2 – Environmental Statistics in the policy-making process

2.1. Environmental statistics from international perspective

The United Nations Conference on the Human Environment (Stockholm, June 1972) noted that environmental concerns have increasingly become the subject of mainstream socio-economic policies, both at the national and international level. In the following years there was little or no change with regards to environment concerns. The World Commission on Environment and Development was to develop new ideas on how to improve environment. In their report “Our Common Future”, (Brundtland Report) it was recommended to focus both on environment and on economic development. One of the consequences was the United Nations Conference on Environment and Development (UNCED) (Rio de Janeiro, June 1992). In this conference a consensus, that strategies for sustainable development should integrate environmental issues into development plans and policies, was reached. The major outputs were the “Rio Declaration on Sustainable Development”, “Agenda 21” and several conventions.

Environmental statistics provide an important input to environmental policy, at the regional, national and international scale. The collation of environmental statistics, however, is fraught with difficulties, due to the wide range of environmental phenomena, data sources and agencies involved. As a result, published statistics are liable to suffer from significant problems of error and non-comparability.

2.2 Environmental statistics in the public and policy making process

Environmental objectives are statements of policy which are intended to be assessed using information from a monitoring program. An environmental monitoring program has to be adequate in its quality and quantity of data so that the environmental objectives can be assessed. Also, the resulting data should be able to contribute information towards decisions to modify policy at a later time if desirable. However, monitoring programs can fail to return satisfactory information for policymakers because future statistical needs have not been anticipated, potential confounding factors were not considered, or sampling protocols did not specify suitable randomization. A key intermediate role exists for the use of statistical inference in providing a logical framework for using monitoring data to test hypotheses about fulfillment of environmental objectives.

In addition to, Environmental statistics is a rapidly growing discipline that is important not only as a division of professional and academic statistics, but also in the accumulation of data on environmental effects and in the formulation of environmental policy by government agencies. Environmental statistics increasingly became an important topic in the policy making process. First of all, environmental statistics are responsible for providing Regional and International agencies with sustainable development indicators. These indicators are the base of the State of Environment Report, which is the responsibility of Ministry of Environment as a reporting agency on environmental issues. Also, Ministry of Environment has responsibility in environmental policies and strategies formulation.

Secondly, environmental statistics in terms of physical and monetary units are the core of environmental accounts which will be integrated in near future in the system of national account (SNA) to tackle the cost of environmental degradation in the GDP, in order to achieve Green-GDP.

Thirdly, environmental statistics are the baseline data for any strategy and action plan concerning environmental policy such as mainstreaming sustainable consumption and production action plan, green growth and the related topics to climate change.

Environmental statistics are frequently requested by researchers and scientific agencies for the development and studies related to different living factors on environment.

Environmental statisticians often experience the difficult task to provide clear results for environmental policy objectives on the basis of complex science, limited data, and many sources of uncertainty. Three issues create particular tension at the environmental science-policy junction: (1) the

general complexity of environmental problems (including scientific uncertainty and insufficient data) and the often negative perceptions associated with their solution, (2) the comparatively recent introduction of quantitative methods and information to the environmental policy process and continued skepticism and ideologically motivated resistance to their routine integration, and (3) the language barriers between policymakers and statisticians as well as between statisticians and other scientists engaged in environmental research. Based on the case study of the 2006 Pilot Environmental Performance Index (EPI) developed by an interdisciplinary team at the universities Yale and Columbia the paper examines how the EPI tackles these tensions while aiming to be a fact-based, statistically sound policy tool that helps countries achieve environmental objectives by tracking progress, identifying environmental "best practices", and providing strategic peer-group analyses.

Institutional Dimension of Environment Statistics

The overall institutional and organizational structure of national statistics in the country and specific information regarding environment statistics in terms of, *inter alia*, policy frameworks, mandates, institutional setup, organization, collaboration, resources, international cooperation and uses is to be identified. Therefore, this information may be of greatest interest from a managerial or policy perspective.

It is divided into the following parts as follows:

A. Identification of institutions
B. Existing national policies relevant to the environment
C. Mandate and organization of national statistics
D. Mandate and organization of environment statistics
E. Production of environment statistics
F. Uses of environment statistics
G. Inter-institutional collaboration for the production of environment statistics
H. Existing and required resources for environment statistics
I. International and regional network
J. Technical assistance and training

2.3. Integrating environment statistics in the policy- making process

There is no single tool exists that can support decision makers throughout the entire policy cycle. Some tools can support two or more steps of the cycle due to their flexibility and features. For example, certain types of Decision Support Systems (DSS) are designed to integrate multiple data management and modeling tools, thereby providing support from the problem identification (e.g. trend analysis) to the monitoring and evaluation phases, with the exclusion of the implementation phase. Some specific technical skills are required for developing and using almost all the tools that supports decision making process. Also, all the tools are to be more effective when multiple stakeholders from different disciplines and sectors are involved in their utilization, and cross sectorial tools support communication across several stakeholder groups. More precisely, most tools require the collaboration of technical experts with decision-makers.

Most of the indicators and measurement frameworks support an integrated, cross-sectorial analysis of policies and plans. This is consistent with the needs for policy making in Jordan, where social development, economic growth and environmental quality are strongly interconnected. This is due to high dependency on environmental and natural resources for economic and social development.

Environmental statistics increasingly became as special need for a sustainable policy making process. The policy making process relies on environmental data for action plans, strategies and regulations on environmental managements. The commitments of the countries with international agreements requires reporting such as national communications and inventory preparation for climate change, state of environment report (SOER), mainstreaming sustainable consumption and production patterns, green economy and sustainable indicators reports. These reports depend on base line environmental data in all sectors to calculate Green House Gas Emissions (GHG), to identify indicators for sustainability to build up State of Environment and indicators related to green economy and Sustainable Development Goals.

Awareness is raised among different Ministries and institutions about the importance of environmental statistics in decision making process. The role in Jordan is to involve multiple stakeholders from different disciplines to formulate a change in the rules, regulations or even in elaborating strategies and environmental reports.

The most important publications that environmental statistics involved in:

- ✓ First, second and third national communication to the United Nation Framework Convention on Climate Change (UNFCCC)
- ✓ National Action Plan for Mainstreaming Consumption and Production (SCP) in different sectors
- ✓ Towards Green Economy
- ✓ Sustainable development Indicators

- ✓ State of Environment Report (SOER)
- ✓ Waste Management

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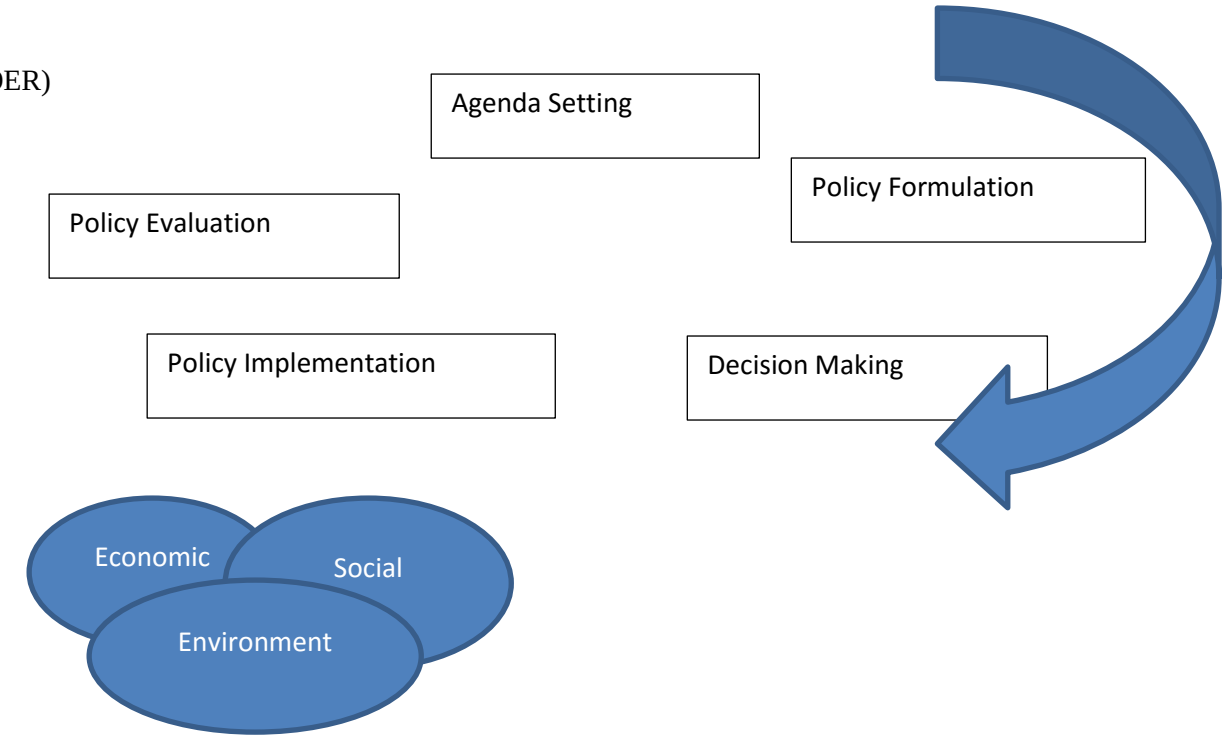

Figure 2. The main steps of the policy cycle, taking into account social, economic and environmental factors for an Inclusive Green Economy and being supported by Integrated Assessment Tools and Methodologies.

Environmental Statistics have a fundamental role in the policy evaluation part of the cycle

This section identifies, discusses and assesses tools and methodologies for an effective support for decision-makers in the different phases of the IP cycle , taking into account the region's specificities, more specifically statistical and data issues.

- Problem identification/Agenda setting: in the context of public policy, an agenda is a list of issues or problems (including potential opportunities, which may be missed without policy interventions) to which government officials, and people outside of the government closely associated with those officials, are paying some serious attention at any given time. Depending on their technical specificities, indicators, scenario creation and

forecasting tools and methodologies can facilitate the identification of worrying trends that might threaten sustainable development in a given country or area.

- Policy formulation: it is intended as a process of generating policy options in response to a problem established on the agenda. In this phase, tools and methodologies can be used to support the identification of key entry points for intervention. In particular, priority should be given to the identification of synergies and complementarities between policies, as well as the capacity of interventions to address the economic, social and environmental aspects of development.
- Decision making: Decision-making is not synonymous with policymaking. In public policy sciences, decision-making is described as a stage where a government decision-maker or an official decision-making body selects a course of action or non-action among a small set of policy options identified at the policy formulation stage with a view towards policy implementation (UNEP, 2009). As such, methodologies and tools can also be used in the decision making phase, through the analysis of their results and especially in relation to the overall assessment of performance (i.e. integrating social, economic and environmental dimensions).
- Policy implementation: Implementation is the stage where a selected policy option must be translated into action. Institutional and technical capacity is crucial at this stage of the policymaking cycle. As in the case of decision making, green economy tools and methodologies are not generally used to inform implementation, which is when institutional arrangements, roles and responsibilities are assigned. On the other hand, indicators (e.g. input indicators, also called policy formulation indicators (UNEP, 2014a)), governance assessments and decision trees can effectively contribute to implementation stage.
- Policy monitoring and evaluation: this phase refers to the effort of monitoring and determining how a policy has performed during implementation. The use of tools and methodologies can provide relevant support in this phase. In particular, tools can be used to monitor the actual impact of policies on a variety of economic, social and environmental indicators, and estimate potential future developments. With the help of indicators, relevant tools and methodologies, decision-makers would be able to identify gaps and potential unintended consequences/side effects of policy interventions, and plan alternative/compensatory policies to ensure the achievement of initial desired goals.

2.4. The role of Ministry of Environment in the policy- making process

Ministry of Environment's (MoEnv) vision to be a leading Ministry at the national, regional and international levels, capable of protecting and sustaining the elements of the environment to improve the quality of life in Jordan, the MoEnv has identified its mission to be **"to improve and preserve the quality in Jordan of the Jordanian environment and preserve natural resources, to contribute to achieving sustainable development through setting and developing implementable polices, strategies, legislation, and monitoring programs, and to introduce environmental concepts in the national development plans."**

The Ministry developed its 2014-2016 strategic plans and identified its strategic objectives, programs and projects to be able to achieve its vision and mission. The Ministry ensured that its objectives and programs are consistent with national initiatives and strategies and that they are in line with the royal directions and the national agenda as well as the Millennium Development Goals (MDG) and the objectives of the environmental sector.

The Ministry is fully committed to implementing the plan, which will support Jordan in achieving the Jordan National Agenda, which outlines 13 national objectives for reaching the goal of improving the quality of life for Jordanians, creating job opportunities and guaranteeing social welfare. **The Ministry of Environment contributes to achieving two of these objectives: protecting the environment and enhancing public administration. The Ministry of Environment also contributes to achieving the seventh MDG, namely, "Ensure Environmental Sustainability." Of the three target areas under this MDG, the Ministry contributes to achieving the following two: 1) integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources, and 2) reduce biodiversity loss and achieve a significant reduction in the rate of loss.**

3 In full cooperation with our partners in government, the private sector and civil society, we identified four main National Environmental Objectives:

1. Protect ecosystem vitality
2. Reduce environmental stresses on human health
3. Raise public awareness in the field of environmental conservation
4. Enhance institutional performance of all entities working in

Environmental conservation

Based on these National Environmental Objectives, the National Agenda and Jordan's commitment to various international treaties and conventions on the environment, the Ministry of Environment has set the following

Strategic Objectives as the basis for its Strategic Plan:

1. Reduce the adverse impacts on the environment and prevent pollution
2. Improve levels and quality of ecosystems
3. Raise public awareness in the field of environmental conservation
4. Enhance the Ministry's institutional capacity to support its mandate

3.2 Priority domain of environmental statistics

- The priority domain of environmental statistics is mainly determined by the National Agenda. The determine factor for economic development is availability of water resources and energy. If a specific country faces deficit in such resources, it will be a priority area in statistics to provide policy maker these data. Also, most important air pollutants, hot spots and air emission from different resources. Waste production from different sectors, composition and management is also apriority in different countries.
- Unifying classifications and definitions of different variables in order to have comparable and accurate data set is one of the most challenging issues in producing environmental statistics.
- Conduct Data Gap Analysis and Assessment periodically, in order to be in line with the accelerated requirements of environmental policy maker and international commitment.
- Providing data in the sustainable development indicators, especially the part related environmental indicators. These indicators were agreed by international community to give a full picture on environment status in all countries and at the same time, these indicators were comparable and have specific fact sheets, definitions and unified methodology for calculation.
- Be aware of most new technologies, policies, raised arguments and new coming subjects related to new environmental issues.

3.3. Data sources

Statistical offices collect and compile statistical data from surveys of households, farmers, manufacturers, services establishments, institutions and so forth. A good portion of environmental database can be created by recasting these data into environmentally relevant categories. There is also an opportunity to obtain environment statistics by modifying questionnaires and survey redesign. For example, questions on fuel wood uses and sources can be added to household survey. Of- course there is possibility of introducing new surveys, devoted to collection of environment statistics, such as surveys on industrial pollution abatement,

recycling activities, and solid waste generation and deposition. In addition to the administrative records from all Ministries, institutions and agencies that have equipment's to (Monitoring stations) to determine air quality, water quality, pesticides residues and other parameters. All socio-economic data were beneficial for analysing environmental sectors in terms of policies, action plans and strategies.

Social, economic and demographic statistics are typically collected through questionnaire survey for individuals of institutions and government agencies such as tax records, school administrative data base, hospital files and so forth. Well documented statistical methods and classifications are an important component of the data collection process. Socio-economic data collection has evolved over time into a mature statistical system. This is in contrast to environmental statistics which are to some extent still at immature stage of statistical development. Bio-physical data are largely obtained from monitoring programs, natural resources inventories, mapping and survey activities, and interpretation of remote sensing imagery. Environmental statistics seek to link these bio-physical data with relevant socio-economic data. Such linkage can be considered the first step toward the incorporation of environmental data into national accounting system.

Bio-physical data bases differ from socio-economic database in their statistical properties and other characteristics, among which are:

- ✓ Data variables based on scientific reading from instruments or laboratory analysis;
- ✓ Analytic/synthetic data produced from ground surveys and remote sensing imagery, frequently recorded in mapped form.
- ✓ Sampling frameworks based on spatial rather than population distribution.
- ✓ Longer time interval is commonly the case in socio-economic systems in order to detect significant environmental changes.
- ✓ Data based on physical measuring units (e.g. weight, volume and area)
- ✓ Lack of well-developed methods and techniques for aggregation and of common denominators;

3.4. Statistical production process

Environmental information includes quantitative and qualitative facts describing the state of the environment and its changes. Quantitative environmental information is generally produced in the form of data, statistics and indicators, and is generally disseminated through databases, spreadsheets, compendia 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.

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The environmental statistics process takes place as follows:

- **Surveys and Studies (sectors)**
  A. Solid and liquid wastes survey in the medical services activity.
  B. Manufacturing of chemicals, plastic and rubber survey in the industrial activity.
  C. Solid Wastes survey for the Municipalities Activity.
  D. Annual Surveys for Banking

E. Hotels and Education Sector Survey.

Most of the environmental surveys are annually conducted, in respect to the updated nature of environmental surveys, some of new surveys might stop or shift to another sector or activities or set of new questions are added to meet the updated requirements of improvement of environmental statistics work.

The objectives of these Surveys:

A. Providing of statistical data on solid and liquid wastes (hazardous and non-hazardous).

B. Providing data on the quantities of used water and wastewater, in addition to methods of disposal and treatment.

C. Providing data on quantity, type and value of consumed energy.

D. Providing data on the expenditures to protect the environment.

E. Providing information on Infrastructure and capital formation, and fixed assets related to water.

F. Providing data related to electronic and electrical waste

- **Surveys Main Documents**
  - Surveys Questionnaires
    - The questionnaire of the manufacturing of chemicals, plastic and rubber in industrial survey.
    - The municipality's questionnaire.
    - The hotels and education activities questionnaire.
    - The medical services questionnaire.
    - Public Sector Questionnaire
  - **Instructions Manuals Which Includes:**

Instructions Manual for completing the questionnaire and explaining the concepts and terms mentioned therein.

A. Editing rules manual for checking data consistency, logically …etc.

B. Special manual for coding the different components of the questionnaire.

- **Data Collection Stages**

The field work was carried out by the selected interviewers under the control of the team supervisors whom in general, have a good experience in field work. The interviewers were distributed into teams and the field work operations were controlled by the field supervisor and the field supervisor check the questionnaires of his team at the end of each working day, then hand them over to the field editor to check them again. Any questionnaire believed to have a mistake return to the field to correct the data or to verify any suspected data. Remarks are discussed with the interviewer and transmitted to all interviewers.

- **Data Processing Stage**
  - **Office Processing**

The completed questionnaires were checked according to written editing rules which were distributed to office editors. Questionnaires containing any suspected data were returned to the field teams for verification, and upon completion of editing operation, questionnaires were coded according to the adopted coding manuals, then codification is also edited.

  - **Electronic Processing**

Data were stored in the main database and the raw data restricted to use in environment division because of the secret of personal information. Final tables become accessible to all data users even who works in DOS or in other national and international institutions.

The edited and coded questionnaires were delivered to the Data Entry Division, to be entered using the special pre-prepared entry programs and electronic edit rules. Upon completion of data entry and data cleaning, the programmer extracts sheets of the preliminary results using the pre-prepared raising factors for editing and verification of the results.

- **Preparation of Report and Dissemination of Results**

After the editing and tabulation operations were completed, the publication’s tables are prepared, and the results are loaded on the DOS website.

Basic Set of Environment Statistics

30 September 2015

Component 1: Environmental Conditions and Quality

Sub-component 1.1: Physical Conditions

Topic	Statistics and Related Information (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)		Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 1.1.1: Atmosphere, climate and weather	a.	Temperature		▪ National ▪ Sub-national	▪ World Meteorological Organization (WMO) ▪ Intergovernmental Panel on Climate Change (IPCC) ▪ National Oceanic and Atmospheric Administration (NOAA)/ National Aeronautics and Space Administration (NASA)
		1. **Monthly average**	Degrees		
		2. **Minimum monthly average**	Degrees		
		3. **Maximum monthly average**	Degrees		
	b.	Precipitation (also in 2.6.1.a)			
		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		▪ National ▪ Sub-national ▪ By station	
		1. *Minimum monthly value*	Pressure unit		
		2. *Maximum monthly value*	Pressure unit		
	e.	Wind speed		▪ National ▪ Sub-national	
		1. *Minimum monthly value*	Speed		
		2. *Maximum monthly value*	Speed		

	f.	Solar radiation		▪ National ▪ Sub-national	▪ WMO ▪ IPCC ▪ NOAA / NASA
		1. *Average daily value*	Area, Energy unit		
		2. *Average monthly value*	Area, Energy unit		
		3. *Number of hours of sunshine*	Number	▪ National ▪ Sub-national ▪ By month and per year	
	g.	UV radiation		▪ National ▪ Sub-national	▪ World Health Organization (WHO)-UV Radiation Index ▪ WMO-UV Radiation
		1. *Maximum daily value*	Area, Energy unit		
		2. *Average daily value*	Area, Energy unit		
		3. *Maximum monthly value*	Area, Energy unit		
		4. *Average monthly value*	Area, Energy unit		
	h.	Occurrence of El Niño/La Niña events, when relevant		▪ By location ▪ National ▪ Sub-national	
		1. *Occurrence*	Number		
		2. *Time period*	Time period		
Topic 1.1.2: Hydrographical characteristics	a.	Lakes		▪ By location ▪ By watershed/river basin ▪ National ▪ Sub-national	▪ United Nations Statistics Division (UNSD): International Recommendations for Water Statistics (IRWS) ▪ UN-Water
		1. Surface area	Area		
		2. *Maximum depth*	Depth		
	b.	Rivers and streams			
		1. Length	Length		
	c.	Artificial reservoirs			
		1. *Surface area*	Area		
		2. *Maximum depth*	Depth		

	d.	Watersheds			
		1. **Description of main watersheds**	Area, Description		
	e.	Seas		▪ By location ▪ National, within coastal waters or Exclusive Economic Zone (EEZ)	
		1. Coastal waters	Area		
		2. Territorial sea	Area		
		3. Exclusive Economic Zone (EEZ)	Area		
		4. *Sea level*	Depth		
		5. *Area of sea ice*	Area		
	f.	*Aquifers*	Depth, Description	▪ By location ▪ By salinity levels ▪ By watershed ▪ National ▪ Sub-national ▪ Renewable ▪ Non-renewable	
	g.	Glaciers	Area	▪ By location ▪ National ▪ Sub-national	
Topic 1.1.3: Geological and geographical information	a.	Geological, geographical and geomorphological conditions of terrestrial areas and islands		▪ National	▪ UNSD: Demographic Yearbook ▪ Food and Agriculture Organization of the United Nations (FAO) ▪ Center for International Earth Science Information Network (CIESIN)
		1. Length of border	Length		
		2. **Area of country or region**	Area, Location		
		3. Number of islands	Number	▪ By location ▪ National	
		4. Area of islands	Area		
		5. *Main geomorphological characteristics of islands*	Description		
		6. *Spatial distribution of land relief*	Description, Location		
		7. *Characteristics of landforms* (e.g., plains, hills, plateaus, dunes, volcanoes, mountains and seamounts)	Description, Area, Height		
		8. *Area by rock types*	Area		

		9. *Length of fault lines*	Length		
	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	a.	Soil characterization		▪ By location ▪ By soil type ▪ National ▪ Sub-national	▪ 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)
		1. **Area by soil types**	Area		
	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. *Area affected by compaction*	Area		
	c.	Nutrient content of soil, measured in levels of:		▪ By soil type ▪ By nutrient ▪ National ▪ Sub-national	
		1. Nitrogen (N)	Concentration		
		2. Phosphorous (P)	Concentration		
		3. *Calcium (Ca)*	Concentration		
		4. *Magnesium (Mg)*	Concentration		
		5. *Potassium (K)*	Concentration		
		6. *Zinc (Zn)*	Concentration		
		7. *Other*	Concentration		

Component 1: Environmental Conditions and Quality

Sub-component 1.2: Land Cover, Ecosystems and Biodiversity

Topic	Statistics and Related Information (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)		Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 1.2.1: Land cover	a.	**Area under land cover categories**	Area	▪ 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 ▪ Sub-national	▪ 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		▪ By location ▪ By ecosystem (e.g., forest, cultivated, dryland, coastal, marine, urban, polar, inland water, island, mountain)[(b)]	▪ Millennium Ecosystem Assessment ▪ Convention on Biological Diversity (CBD) ▪ UN Economic Commission for
		1. **Area of ecosystems**	Area		
		2. *Proximity of ecosystem to urban areas and cropland*	Distance		
	b.	Ecosystems' chemical and physical characteristics			
		1. *Nutrients*	Concentration		
		2. *Carbon*	Concentration		

		3. *Pollutants*	Concentration		Europe (UNECE) Standard Statistical Classification of Flora, Fauna and Biotopes (1996) ▪ Convention on Wetlands of International Importance, especially as Waterfowl Habitat (the Ramsar Convention)
	c.	Biodiversity		▪ 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, reptiles) ▪ National ▪ Sub-national	▪ Millennium Ecosystem Assessment ▪ CBD ▪ International Union for Conservation of Nature (IUCN) Red List of Threatened Species ▪ UNECE Standard Statistical Classification of Flora, Fauna and Biotopes (1996) ▪ FAO FISHSTAT (Species population and number of invasive alien species)
		1. **Known flora and fauna species**	Number		
		2. Endemic flora and fauna species	Number		
		3. Invasive alien flora and fauna species	Number		
		4. Species population	Number		
		5. *Habitat fragmentation*	Area, Description, Location, Number		
	d.	Protected areas and species		▪ By location ▪ By management category[(c)] ▪ By ecosystem (e.g., forest, cultivated, dryland, coastal, marine, urban, polar, inland water, island, mountain)[(b)] ▪ National ▪ Sub-national	▪ IUCN Protected Area Management Categories ▪ UNSD: Millennium Development Goal (MDG) Indicator 7.6 Metadata
		1. **Protected terrestrial and marine area** (also in 1.2.3.a)	Number, Area		

		2. Protected flora and fauna species	Number	▪ By species ▪ By ecosystem (e.g., forest, cultivated, dryland, coastal, marine, urban, polar, inland water, island, mountain)[(b)] ▪ By status category ▪ National ▪ Sub-national	▪ IUCN Red List of Threatened Species ▪ UNSD: MDG Indicator 7.7 Metadata
(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 (http://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 (http://www.iucn.org/about/work/programmes/gpap_home/gpap_quality/gpap_pacategories/)					
Topic 1.2.3: Forests	a.	Forest area		▪ By forest type ▪ National ▪ Sub-national ▪ By dominant tree species ▪ By ownership category	▪ 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			
		1. Total	Volume		
		2. *Carbon storage in living forest biomass*	Mass		

Component 1: Environmental Conditions and Quality

Sub-component 1.3: Environmental Quality

Topic	Statistics and Related Information (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)		Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 1.3.1: Air quality	a.	Local air quality		▪ By point measurement ▪ Sub-national ▪ Daily maximum ▪ Monthly maximum and average ▪ Yearly maximum and average	▪ 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 (PM_{10})**	Concentration		
		2. **Concentration level of particulate matter ($PM_{2.5}$)**	Concentration		
		3. **Concentration level of tropospheric ozone (O_3)**	Concentration		
		4. **Concentration level of carbon monoxide (CO)**	Concentration		
		5. **Concentration level of sulphur dioxide (SO_2)**	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. *Concentration levels of dioxins*	Concentration		
		10. *Concentration levels of furans*	Concentration		
		11. Concentration levels of other pollutants	Concentration		
		12. Number of days when maximum allowable levels were exceeded per year	Number	▪ By pollutant	
	b.	Global atmospheric concentrations of greenhouse gases		▪ 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	a.	Nutrients and chlorophyll		▪ By water body ▪ By watershed/river basin ▪ By surface or groundwater	▪ UNECE Standard Statistical Classification of
		1. **Concentration level of nitrogen**	Concentration		
		2. **Concentration level of phosphorous**	Concentration		

quality		3. Concentration level of chlorophyll A	Concentration	▪ By point measurement ▪ By type of water resource	Freshwater Quality for the Maintenance of Aquatic Life (1992) ▪ UN Environment Programme (UNEP) Global Environment Monitoring System - Water (GEMS-Water) ▪ WHO
	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)			▪ UNECE Standard Statistical Classification of Freshwater Quality for the Maintenance of Aquatic Life (1992) ▪ UNEP GEMS-Water ▪ Stockholm Convention
		1. Concentration levels in sediment and freshwater	Concentration		
		2. Concentration levels in freshwater organisms	Concentration		
	f.	Physical and chemical characteristics			▪ UNECE Standard Statistical Classification of Freshwater Quality for the Maintenance of Aquatic Life (1992) ▪ UNEP GEMS-Water
		1. pH/Acidity/Alkalinity	Level		
		2. Temperature	Degrees		
		3. *Total suspended solids (TSS)*	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		
Topic 1.3.3: Marine water quality	a.	Nutrients and chlorophyll		▪ By coastal zone, delta, estuary or other local marine environment ▪ Sub-national ▪ National ▪ Supranational ▪ By point measurement ▪ By water resource	▪ UNECE Standard Statistical Classification of Marine Water Quality (1992) ▪ NOAA/NASA ▪ UNEP Regional
		1. **Concentration level of nitrogen**	Concentration		
		2. **Concentration level of phosphorous**	Concentration		
		3. Concentration level of chlorophyll A	Concentration		
	b.	Organic matter			
		1. **Biochemical oxygen demand (BOD)**	Concentration		

		2. Chemical oxygen demand (COD)	Concentration		Seas Programme
	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)			▪ UNECE Standard Statistical Classification of Marine Water Quality (1992) ▪ NOAA/NASA ▪ UNEP Regional Seas Programme ▪ Stockholm Convention
		1. *Concentration levels in sediment and marine water*	Concentration		
		2. *Concentration levels in marine organisms*	Concentration		
	f.	Physical and chemical characteristics			▪ UNECE Standard Statistical Classification of Marine Water Quality (1992) ▪ NOAA/NASA ▪ UNEP Regional Seas Programme
		1. *pH/Acidity/Alkalinity*	Level		
		2. Temperature	Degrees		
		3. *Total suspended solids (TSS)*	Concentration		
		4. *Salinity*	Concentration		
		5. Dissolved oxygen (DO)	Concentration		
		6. *Density*	Density		
	g.	Coral bleaching			
		1. **Area affected by coral bleaching**	Area		
	h.	Plastic waste and other marine debris		▪ By coastal zone, delta, estuary or other local marine environment ▪ By location ▪ Sub-national ▪ National ▪ Supranational ▪ By point measurement	▪ UNECE Standard Statistical Classification of Marine Water Quality (1992) ▪ NOAA/NASA ▪ UNEP Regional
		1. *Amount of plastic waste and other debris in marine waters*	Area, Mass		
	i.	Red tide			
		1. *Occurrence*	Number		
		2. *Impacted area*	Area		

		3. *Duration*	Duration		Seas Programme
	j.	Oil pollution			
		1. *Area of oil slicks*	Area		
		2. *Amount of tar balls*	Area, Diameter, Number		
Topic 1.3.4: Soil pollution	a.	Sites affected by pollution		▪ By location ▪ Sub-national ▪ By type of pollutant ▪ By source	
		1. Contaminated sites	Area, Number		
		2. Potentially contaminated sites	Area, Number		
		3. Remediated sites	Area, Number		
		4. Other sites	Area, Number		
Topic 1.3.5: Noise	a.	Noise levels from specific sources	Level	▪ By source ▪ By location ▪ Sub-national	▪ WHO
	b.	Noise levels in specific locations	Level		

Component 2: Environmental Resources and their Use

Sub-component 2.1: Mineral Resources

Topic	Statistics and Related Information (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)		Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 2.1.1: Stocks and changes of mineral resources	a.	Mineral resources		▪ 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) ▪ National ▪ Sub-national	▪ 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		
		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		
Topic 2.1.2: Production and trade of minerals	a.	Production of minerals	Mass, Volume		▪ 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		

Component 2: Environmental Resources and their Use

Sub-component 2.2: Energy Resources

Topic	Statistics and Related Information (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)		Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 2.2.1: Stocks and changes of energy resources	a.	Energy resources		▪ 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) ▪ National ▪ Sub-national	▪ 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		
		2. New discoveries	Mass, Volume		
		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		
Topic 2.2.2: Production, trade and consumption of energy	a.	Production of energy		▪ By non-renewable resource (e.g., petroleum, natural gas, coal, nuclear fuels, non-sustainable firewood, waste, other non-renewables) ▪ By renewable resource (e.g., solar, hydroelectric, geothermal, tidal action, wave action, marine, wind and biomass) ▪ National ▪ Sub-national	▪ UNSD: IRES ▪ IEA Energy Statistics Manual ▪ Joint Wood Energy Enquiry (UNECE-FAO Forestry and Timber Section)
		1. **Total production**	Energy unit, Mass, Volume		
		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	▪ By primary energy resource (e.g., petroleum, natural gas, coal, hydroenergy, geothermal,	

		5. Imports of energy	Energy unit, Mass, Volume	nuclear fuels, cane products, other primary) ▪ By secondary energy resource (e.g., electricity, liquefied petroleum gas, gasoline/alcohol, kerosene, diesel oil, fuel oil, coke, charcoal, gases, other secondary) ▪ National ▪ Sub-national	
		6. Exports of energy	Energy unit, Mass, Volume		
		7. **Secondary energy production**	Energy unit, Mass, Volume		
	b.	**Total energy supply**	Energy unit, Mass, Volume	▪ By energy product	
	c.	**Final consumption of energy**	Energy unit, Mass, Volume	▪ By households ▪ By ISIC economic activity ▪ By tourists ▪ National ▪ Sub-national	

Component 2: Environmental Resources and their Use

Sub-component 2.3: Land

Topic		Statistics and Related Information (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)	Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 2.3.1: Land use	a.	**Area under land use categories**	Area	▪ 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 area of coral reefs and mangroves); Exclusive Economic Zone (EEZ)) ▪ National ▪ Sub-national	▪ FAO ▪ UNECE Standard Classification of Land Use (1989) ▪ SEEA Central Framework (2012) Annex 1
	b.	Other aspects of land use		▪ National ▪ Sub-national	
		1. *Area of land under organic farming*	Area		▪ FAO Inter-departmental Working Group on Organic Agriculture
		2. Area of land under irrigation	Area		
		3. Area of land under sustainable forest management	Area		▪ Forest Stewardship Council
		4. *Area of land under agroforestry*	Area		
	c.	Land ownership	Area	▪ By ownership category ▪ National ▪ Sub-national	▪ FAO
Topic 2.3.2: Use of forest land	a.	Use of forest land		▪ By forest type ▪ National ▪ Sub-national ▪ By dominant tree species	▪ FAO FRA ▪ UNFF MAR ▪ UNSD: MDG Indicator 7.1 Metadata
		1. **Area deforested**	Area		
		2. Area reforested	Area		
		3. Area afforested	Area		

		4. *Natural growth*	Area		▪ 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)
	b.	Forest area by primary designated function	Area	▪ Production ▪ Protection of soil and water ▪ Conservation of biodiversity ▪ Social services ▪ Multiple use ▪ Other	▪ FAO FRA

Component 2: Environmental Resources and their Use				
Sub-component 2.4: Soil Resources				
Topic	**Statistics and Related Information** (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)	**Category of Measurement**	**Potential Aggregations and Scales**	**Methodological Guidance**
Topic 2.4.1: Soil resources	Further research is needed to develop the necessary statistics in this topic.			

Component 2: Environmental Resources and their Use

Sub-component 2.5: Biological Resources

Topic	Statistics and Related Information (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)		Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 2.5.1: Timber resources	a.	Timber resources		▪ By type (e.g., natural or planted) ▪ National ▪ Sub-national	▪ 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. *Felling residues*	Volume		
		6. *Natural losses*	Volume		
		7. *Catastrophic losses*	Volume		
		8. *Reclassifications*	Volume		
	b.	Amount used of:		▪ National ▪ Sub-national	
		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	▪ By type of product (e.g., timber, industrial roundwood, fuelwood, pulp, chips) ▪ National ▪ Sub-national	▪ 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	▪ National	▪ FAO/ITTO/ UNECE/ Eurostat Inter-secretariat Working Group on Forest Sector Statistics ▪ State of Europe's Forests (Forest Europe/UNECE-FAO Forestry and Timber Section) ▪ HS 2012, Sections IX and X ▪ FAOSTAT database
	e.	Imports of forest products	Currency, Mass, Volume	▪ By type of product	
	f.	Exports of forest products	Currency, Mass, Volume		
Topic 2.5.2: Aquatic resources	a.	**Fish capture production**	Mass	▪ By relevant freshwater and marine species ▪ National ▪ Sub-national	▪ FAO International Standard Statistical Classification for Aquatic Animals and Plants (ISSCAAP) ▪ ISIC Rev. 4, Section A, Division 03 ▪ The United Nations Convention on the Law of the Sea (UNCLOS) ▪ UNSD: MDG Indicator 7.4 Metadata
	b.	**Aquaculture production**	Mass		
	c.	Imports of fish and fishery products	Currency, Mass, Volume	▪ By relevant freshwater and marine species ▪ By type of product ▪ By species	
	d.	Exports of fish and fishery products	Currency, Mass, Volume		
	e.	Amount used of:		▪ By type of water (i.e., marine or freshwater) ▪ National ▪ Sub-national	
		1. *Pellets (also in 3.4.1.c)*	Mass, Volume		
		2. *Hormones (also in 3.4.1.d)*	Mass, Volume		
		3. *Colourants (also in 3.4.1.e)*	Mass, Volume		
		4. *Antibiotics (also in 3.4.1.f)*	Mass, Volume		

		5. *Fungicides*	Mass, Volume		▪ HS 2012, Section I, Chapter 03 ▪ SEEA Central Framework (2012)
	f.	Aquatic resources		▪ By relevant freshwater and marine species ▪ By type (e.g., natural or cultivated) ▪ National ▪ Sub-national	
		1. Stocks of aquatic resources	Mass		
		2. *Additions to aquatic resources*	Mass		
		3. *Reductions in aquatic resources*	Mass		
Topic 2.5.3: Crops	a.	Main annual and perennial crops		▪ By crop ▪ By size ▪ National ▪ Sub-national	▪ FAO Indicative Crop Classification (for 2010 round of agricultural censuses) ▪ FAO/WHO Specifications for Pesticides (2010) ▪ FAO Specifications for Commonly Used Fertilizers (2009) ▪ ISIC Rev. 4, Section A, Division 1 ▪ FAOSTAT database ▪ HS 2012, Section II
		1. **Area planted**	Area		
		2. **Area harvested**	Area		
		3. **Amount produced**	Mass		
		4. *Amount of organic production*	Mass		
		5. *Amount of genetically modified crops produced*	Mass		
	b.	Amount used of:		▪ By type of fertilizer ▪ By type of pesticide ▪ By crop ▪ National ▪ Sub-national	
		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		
		4. Genetically modified seeds	Mass	▪ By crop ▪ National ▪ Sub-national	
	c.	Monoculture/resource-intensive farming systems		▪ By crop ▪ By size ▪ National ▪ Sub-national	
		1. Area being used for production	Area		
		2. Amount produced	Mass		
		3. *Amount of genetically modified crops produced*	Mass		
	d.	Imports of crops	Currency, Mass		
	e.	Exports of crops	Currency, Mass		
Topic 2.5.4: Livestock	a.	Livestock		▪ By type of animal ▪ National ▪ Sub-national	▪ FAOSTAT database ▪ ISIC Rev. 4, Section A, Division 01 ▪ HS 2012, Section I, Chapter 01
		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		
Topic 2.5.5: Other non-cultivated biological resources	a.	Permits for regulated hunting and trapping of wild animals		▪ By species	▪ ISIC Rev. 4, Section A, Class 0170
		1. Number of permits issued per year	Number		
		2. Number of animal kills allowed by permits	Number		
	b.	Imports of endangered species	Currency, Number		▪ Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
	c.	Exports of endangered species	Currency, Number		
	d.	*Reported wild animals killed or trapped for food or sale*	Number		▪ ISIC Rev. 4, Section A, Class 0170
	e.	*Trade in wildlife and captive-bred species*	Description, Mass, Number	▪ By status category ▪ National ▪ Sub-national	▪ CITES
	f.	*Non-wood forest products and other plants*	Mass, Volume	▪ By type of product ▪ National ▪ Sub-national	▪ ISIC Rev. 4, Section A, Class 0230

Component 2: Environmental Resources and their Use

Sub-component 2.6: Water Resources

Topic		Statistics and Related Information (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)	Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 2.6.1: Water resources	a.	Inflow of water to inland water resources		▪ National ▪ Sub-national ▪ By territory of origin and destination	▪ UNSD: IRWS ▪ UNECE Standard Statistical Classification of Water Use (1989) ▪ UNSD: MDG Indicator 7.5 Metadata ▪ FAO AQUASTAT ▪ SEEA Central Framework (2012) asset accounts ▪ SEEA Water ▪ UNSD: Environment Statistics Section - Water Questionnaire
		1. **Precipitation** (also in 1.1.1.b)	Volume		
		2. **Inflow from neighbouring territories**	Volume		
		3. *Inflow subject to treaties*	Volume		
	b.	Outflow of water from inland water resources			
		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		▪ National ▪ Sub-national	
		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		
Topic 2.6.2: Abstraction, use and returns of water	a.	**Total water abstraction**	Volume	▪ By type of source ▪ National ▪ Sub-national	▪ UNSD: IRWS ▪ UNECE Standard Statistical Classification of Water Use (1989) ▪ FAO AQUASTAT ▪ SEEA Central Framework (2012) ▪ SEEA Water ▪ UNSD: Environment Statistics
	b.	**Water abstraction from surface water**	Volume		
	c.	Water abstraction from groundwater			
		1. **From renewable groundwater resources**	Volume		
		2. **From non-renewable groundwater resources**	Volume		
	d.	Water abstracted for own use	Volume	▪ By ISIC economic activity ▪ National ▪ Sub-national	
	e.	Water abstracted for distribution	Volume		
	f.	Desalinated water	Volume	▪ National ▪ Sub-national	
	g.	Reused water	Volume		

	h.	Water use	Volume	▪ By ISIC economic activity ▪ By tourists ▪ National ▪ Sub-national	Section - Water Questionnaire
	i.	*Rainwater collection*	Volume	▪ National ▪ Sub-national	
	j.	*Water abstraction from the sea*	Volume		
	k.	Losses during transport	Volume	▪ By ISIC economic activity ▪ National ▪ Sub-national	
	l.	*Exports of water*	Volume	▪ National ▪ Sub-national	
	m.	*Imports of water*	Volume		
	n.	*Returns of water*	Volume	▪ By ISIC economic activity ▪ By destination (e.g., inland water, land, sea, ocean) ▪ National ▪ Sub-national	

Component 3: Residuals

Sub-component 3.1: Emissions to Air

Topic		Statistics and Related Information (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)	Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 3.1.1: Emissions of greenhouse gases	a.	Total emissions of direct greenhouse gases (GHGs), by gas:		▪ By ISIC economic activity ▪ By tourists ▪ National ▪ Sub-national ▪ By IPCC source categories	▪ IPCC Emission Factor Database ▪ UN Framework Convention on Climate Change (UNFCCC) Reporting Guidelines ▪ UNECE Standard Statistical Classification of Ambient Air Quality (1990) ▪ UNSD: MDG Indicator 7.2 Metadata ▪ WHO
		1. **Carbon dioxide (CO_2)**	Mass		
		2. **Methane (CH_4)**	Mass		
		3. **Nitrous oxide (N_2O)**	Mass		
		4. Perfluorocarbons (PFCs)	Mass		
		5. Hydrofluorocarbons (HFCs)	Mass		
		6. Sulphur hexafluoride (SF_6)	Mass		
	b.	Total emissions of indirect greenhouse gases (GHGs), by gas:			
		1. **Sulphur dioxide (SO_2)**	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	a.	Consumption of ozone depleting substances (ODS), by substance:			▪ UNEP Ozone Secretariat ▪ IPCC Emission Factor Database ▪ UNECE Standard Statistical Classification of Ambient Air Quality (1990) ▪ UNSD: MDG
		1. Chlorofluorocarbons (CFCs)	Mass		
		2. Hydrochlorofluorocarbons (HCFCs)	Mass		
		3. Halons	Mass		
		4. Methyl chloroform	Mass		
		5. Carbon tetrachloride	Mass		

		6. Methyl bromide	Mass		Indicator 7.3 Metadata ▪ WHO
		7. Other	Mass		
Topic 3.1.3. Emissions of other substances	a.	Emissions of other substances:			▪ UNECE Standard Statistical Classification of Ambient Air Quality (1990) ▪ European Monitoring and Evaluation Programme (EMEP) under the Convention on Long-range Transboundary Air Pollution
		1. Particulate matter (PM)	Mass		
		2. Heavy metals	Mass		
		3. *Other*	Mass		

Component 3: Residuals

Sub-component 3.2: Generation and Management of Wastewater

Topic		Statistics and Related Information (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)	Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 3.2.1: Generation and pollutant content of wastewater	a.	**Volume of wastewater generated**	Volume	▪ By ISIC economic activity ▪ By tourists ▪ National ▪ Sub-national	▪ UNSD: IRWS ▪ ISIC Rev. 4, Section E, Divisions 35-37 ▪ SEEA Water ▪ UNSD: Environment Statistics Section - Water Questionnaire
	b.	Pollutant content of wastewater	Mass	▪ 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 ▪ Sub-national	
Topic 3.2.2: Collection and treatment of wastewater	a.	**Volume of wastewater collected**	Volume	▪ National ▪ Sub-national	▪ UNSD: IRWS ▪ ISIC Rev. 4, Section E, Division 35 and 36 ▪ UNSD: Environment Statistics Section - Water Questionnaire
	b.	**Volume of wastewater treated**	Volume	▪ By treatment type (e.g., primary, secondary, tertiary) ▪ National ▪ Sub-national	
	c.	Total urban wastewater treatment capacity			
		1. Number of plants	Number		
		2. Capacity of plants	Volume		
	d.	Total industrial wastewater treatment capacity			
		1. Number of plants	Number		
		2. Capacity of plants	Volume		
Topic 3.2.3: Discharge of wastewater to the environment	a.	Wastewater discharge		▪ By treatment type (e.g., primary, secondary, tertiary) ▪ By recipient (e.g., surface water, groundwater, wetland, sea, land) ▪ By ISIC economic activity ▪ National ▪ Sub-national ▪ By source (point/non-point source)	
		1. **Total volume of wastewater discharged to the environment after treatment**	Volume		
		2. **Total volume of wastewater discharged to the environment without treatment**	Volume		

	b.	Pollutant content of discharged wastewater	Mass	▪ By pollutant or pollution parameter (e.g., BOD, COD, nitrogen, phosphorous) ▪ National ▪ Sub-national ▪ Net emission by ISIC economic activity ▪ By source (point/non-point source)	

Component 3: Residuals

Sub-component 3.3: Generation and Management of Waste

Topic	Statistics and Related Information (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)		Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 3.3.1: Generation of waste	a.	**Amount of waste generated by source**	Mass	▪ By ISIC economic activity ▪ By households ▪ By tourists ▪ National ▪ Sub-national	▪ European Commission: European List of Waste, pursuant to European Waste Framework Directive ▪ Eurostat: Environmental Data Centre on Waste ▪ 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
	b.	Amount of waste generated by waste category	Mass	▪ By waste category (e.g., chemical waste, municipal waste, food waste, combustion waste) ▪ National ▪ Sub-national	
	c.	**Amount of hazardous waste generated**	Mass	▪ By ISIC economic activity ▪ National ▪ Sub-national	

Topic 3.3.2: Management of waste	a.	Municipal waste		▪ By type of treatment and disposal (e.g., reuse, recycling, composting, incineration, landfilling, other) ▪ By type of waste, when possible ▪ National ▪ Sub-national	▪ Eurostat: Environmental Data Centre on Waste ▪ Eurostat metadata: Organisation for Economic Co-operation and Development (OECD)/Eurostat definition of municipal waste ▪ UNSD: Environment Statistics Section - Waste Questionnaire ▪ Basel Convention: Waste categories and hazardous characteristics ▪ Eurostat: EWC-Stat, version 4 (Waste categories) ▪ 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 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		
		4. Capacity of municipal waste treatment and disposal facilities	Volume		
	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		
		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	▪ By specific waste streams (e.g., e-waste, packaging waste, end of life vehicles) ▪ By waste category ▪ National ▪ Sub-national	
	e.	Imports of waste	Mass	▪ By waste category (e.g., chemical waste, municipal waste, combustion waste)	
	f.	Exports of waste	Mass		
	g.	Imports of hazardous waste	Mass		
	h.	Exports of hazardous waste	Mass		

Component 3: Residuals

Sub-component 3.4: Release of Chemical Substances

Topic	Statistics and Related Information (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)		Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 3.4.1: Release of chemical substances	a.	Total amount of fertilizers used		▪ National ▪ Sub-national ▪ By ISIC economic activity (forestry, agriculture) ▪ By type of fertilizer ▪ By type of pesticide	▪ FAOSTAT database ▪ Stockholm Convention
		1. Natural fertilizers (also in 2.5.1.b and 2.5.3.b)	Area, Mass, Volume		
		2. Chemical fertilizers (also in 2.5.1.b and 2.5.3.b)	Area, Mass, Volume		
	b.	Total amount of pesticides used (also in 2.5.1.b and 2.5.3.b)	Area, Mass, Volume		
	c.	*Total amount of pellets used (also in 2.5.2.e)*	Mass, Volume	▪ National ▪ Sub-national ▪ By ISIC economic activity (aquaculture)	▪ Stockholm Convention
	d.	*Total amount of hormones used (also in 2.5.2.e and 2.5.4.b)*	Mass, Volume	▪ National ▪ Sub-national ▪ By ISIC economic activity (aquaculture, livestock production)	
	e.	*Total amount of colourants used (also in 2.5.2.e)*	Mass, Volume	▪ National ▪ Sub-national ▪ By ISIC economic activity (aquaculture)	
	f.	*Total amount of antibiotics used (also in 2.5.2.e and 2.5.4.b)*	Mass, Volume	▪ National ▪ Sub-national ▪ By ISIC economic activity (aquaculture, livestock production)	

Component 4: Extreme Events and Disasters

Sub-component 4.1: Natural Extreme Events and Disasters

Topic		Statistics and Related Information (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)	Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 4.1.1: Occurrence of natural extreme events and disasters	a.	Occurrence of natural extreme events and disasters		▪ By event ▪ National ▪ Sub-national	▪ Centre for Research on the Epidemiology of Disasters Emergency Events Database (CRED EMDAT) ▪ UN Economic Commission for Latin America and the Caribbean (ECLAC) Handbook for Estimating the Socio-economic and Environmental Effects of Disasters ▪ The United Nations Office for Disaster Risk Reduction (UNISDR)
		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		
Topic 4.1.2: Impact of natural extreme events and disasters	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	▪ By event ▪ By ISIC economic activity ▪ National ▪ Sub-national ▪ By direct and indirect damage	
	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		▪ By event ▪ By ecosystem ▪ National ▪ Sub-national	
		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	▪ By event ▪ National	

Component 4: Extreme Events and Disasters

Sub-component 4.2: Technological Disasters

Topic		Statistics and Related Information **(Bold Text - Core Set/Tier 1;** Regular Text - Tier 2; *Italicized Text - Tier 3*)	Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 4.2.1: Occurrence of technological disasters	a.	Occurrence of technological disasters		▪ By event ▪ By ISIC economic activity ▪ National ▪ Sub-national	▪ CRED EMDAT ▪ ECLAC: 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		
Topic 4.2.2: Impact of technological disasters	a.	People affected by technological disasters		▪ By event ▪ National ▪ Sub-national	
		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	▪ By event ▪ By ISIC economic activity ▪ National ▪ Sub-national ▪ By direct and indirect damage	
	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		▪ By event ▪ National ▪ Sub-national	
		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	▪ By event ▪ National	

Component 5: Human Settlements and Environmental Health

Sub-component 5.1: Human Settlements

Topic		Statistics and Related Information (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)	Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 5.1.1: Urban and rural population	a.	Population living in urban areas	Number	▪ Urban ▪ Rural	▪ UN Population Division ▪ UN Population Fund (UNFPA)
	b.	Population living in rural areas	Number		
	c.	Total urban area	Area		
	d.	Total rural area	Area		
	e.	Population living in coastal areas	Number		
Topic 5.1.2: Access to selected basic services	a.	**Population using an improved drinking water source**	Number	▪ Urban ▪ Rural ▪ National ▪ Sub-national	▪ UNSD: MDG Indicator 7.8 and 7.9 Metadata ▪ UN-Water ▪ UNSD: Environment Statistics Section - Water and Waste Questionnaire ▪ WHO/(United Nations Children's Fund (UNICEF) Joint Monitoring Programme for Water Supply and Sanitation
	b.	**Population using an improved sanitation facility**	Number		
	c.	**Population served by municipal waste collection**	Number		
	d.	*Population connected to wastewater collecting system*	Number	▪ By treatment type (e.g., primary, secondary, tertiary) ▪ National ▪ Sub-national	▪ UNSD: IRWS ▪ ISIC Rev. 4, Section E, Division 35-37 ▪ UNSD: Environment Statistics Section - Water Questionnaire
	e.	**Population connected to wastewater treatment**	Number		
	f.	**Population supplied by water supply industry**	Number	▪ National ▪ Sub-national	
	g.	Price of water	Currency	▪ By source (e.g., piped, vendor)	

	h.	Population with access to electricity	Number		
	i.	Price of electricity	Currency		
Topic 5.1.3: Housing conditions	a.	Urban population living in slums	Number		▪ UN Habitat ▪ UNSD: MDG Indicator 7.10 Metadata
	b.	Area of slums	Area		
	c.	Population living in hazard-prone areas	Number	▪ Urban ▪ Rural ▪ National ▪ Sub-national	
	d.	Hazard-prone areas	Area		
	e.	*Population living in informal settlements*	Number		
	f.	*Homeless population*	Number		
	g.	*Number of dwellings with adequacy of building materials defined by national or local standards*	Number		
Topic 5.1.4: Exposure to ambient pollution	a.	Population exposed to air pollution in main cities	Number	▪ By pollutant (e.g., SO_2, NOx, O_3)	▪ WHO
	b.	*Population exposed to noise pollution in main cities*	Number		
Topic 5.1.5: Environmental concerns specific to urban settlements	a.	Extent of urban sprawl	Area		▪ UN Habitat ▪ WHO ▪ UNEP Urban Environment Unit
	b.	Available green spaces	Area		
	c.	**Number of private and public vehicles**	Number	▪ By type of engine or type of fuel	
	d.	Population using public modes of transportation	Number		
	e.	*Population using hybrid and electric modes of transportation*	Number		
	f.	Extent of roadways	Length		
	g.	*Existence of urban planning and zoning regulations and instruments in main cities*	Description		
	h.	*Effectiveness of urban planning and zoning regulations and instruments in main cities*	Description		

Component 5: Human Settlements and Environmental Health

Sub-component 5.2: Environmental Health

Topic		Statistics and Related Information (**Bold Text - Core Set/Tier 1**; Regular Text - Tier 2; *Italicized Text - Tier 3*)	Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 5.2.1: Airborne diseases and conditions	a.	Airborne diseases and conditions		▪ By disease or condition ▪ National ▪ Sub-national ▪ Urban ▪ Rural ▪ By gender ▪ By age group ▪ By time period	▪ WHO
		1. Incidence	Number		
		2. Prevalence	Number		
		3. Mortality	Number		
		4. *Loss of work days*	Number		
		5. *Estimates of economic cost in monetary terms*	Currency		
Topic 5.2.2: Water-related diseases and conditions	a.	Water-related diseases and conditions			
		1. **Incidence**	Number		
		2. **Prevalence**	Number		
		3. **Mortality**	Number		
		4. *Loss of work days*	Number		
		5. *Estimates of economic cost in monetary terms*	Currency		
Topic 5.2.3: Vector-borne diseases	a.	Vector-borne diseases			
		1. **Incidence**	Number		
		2. **Prevalence**	Number		
		3. **Mortality**	Number		
		4. *Loss of work days*	Number		
		5. *Estimates of economic cost in monetary terms*	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. *Loss of work days*	Number		
		4. *Estimates of economic cost in monetary terms*	Currency		

Topic 5.2.5: Toxic substance- and nuclear radiation-related diseases and conditions	a.	Toxic substance-and nuclear radiation-related diseases and conditions		▪ By category of toxic substance ▪ By disease or condition ▪ National ▪ Sub-national ▪ Urban ▪ Rural ▪ By gender ▪ By age group	▪ WHO
		1. Incidence	Number		
		2. Prevalence	Number		
		3. *Loss of work days*	Number		
		4. *Estimates of economic cost in monetary terms*	Currency		

Component 6: Environment Protection, Management and Engagement

Sub-component 6.1: Environmental Protection and Resource Management Expenditure

Topic	Statistics and Related Information (Bold Text - Core Set/Tier 1; Regular Text - Tier 2; Italicized Text - Tier 3)		Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 6.1.1: Government environmental protection and resource management expenditure	a.	Government environmental protection and resource management expenditure		▪ By environmental activity ▪ By type of expenditure: current, investment ▪ By ministry ▪ National ▪ Sub-national ▪ By funding	▪ Eurostat - SERIEE Environmental Protection Expenditure Accounts Compilation Guide (2002) ▪ Eurostat - Environmental expenditure Statistics. General Government and Specialised Producers Data Collection Handbook (2007) ▪ Classification of Environmental Activities (CEA) ▪ SEEA Central Framework (2012) Annex 1
		1. **Annual government environmental protection expenditure**	Currency		
		2. Annual government resource management expenditure	Currency		
Topic 6.1.2: Corporate, non-profit institution and household environmental protection and resource	a.	Private sector environmental protection and resource management expenditure		▪ By environmental activity ▪ By type of expenditure: current, investment ▪ By ISIC economic activity ▪ National ▪ Sub-national	▪ Eurostat – Environmental expenditure statistics. Industry data collection handbook (2005) ▪ Eurostat – Environmental expenditure Statistics. General Government
		1. Annual corporate environmental protection expenditure	Currency		
		2. *Annual corporate resource management expenditure*	Currency		
		3. *Annual non-profit institution environmental protection expenditure*	Currency		
		4. *Annual non-profit institution resource management expenditure*	Currency		

management expenditure		5. *Annual household environmental protection expenditure*	Currency		and Specialised Producers Data Collection Handbook (2007)
		6. *Annual household resource management expenditure*	Currency		

Component 6: Environmental Protection, Management and Engagement

Sub-component 6.2: Environmental Governance and Regulation

Topic	Statistics and Related Information (Bold Text - Core Set/Tier 1; Regular Text - Tier 2; Italicized Text - Tier 3)		Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 6.2.1: Institutional strength	a.	Government environmental institutions and their resources		▪ National ▪ Sub-national	
		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		
		6. Number of staff of environmental departments in other authorities	Number		
	b.	Other environmental institutions and their resources		▪ National ▪ Sub-national	
		1. Name of institution and year of establishment	Description		
		2. Annual budget of the institution	Currency		
		3. Number of staff in the institution	Number		
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 ▪ Sub-national	
		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 environmental conventions	a.	Participation in MEAs and other global environmental conventions			▪ MEA Secretariats
		1. **List and description (e.g., country's year of participation[(d)]) of MEAs and other global environmental conventions**	Description, 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.					

Component 6: Environmental Protection, Management and Engagement

Sub-component 6.3: Extreme Event Preparedness and Disaster Management

Topic		Statistics and Related Information (Bold Text - Core Set/Tier 1; Regular Text - Tier 2; Italicized Text - Tier 3)	Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 6.3.1: Preparedness for natural extreme events and disasters	a.	National natural extreme event and disaster preparedness and management systems		▪ National ▪ Sub-national	▪ International Emergency Management Organization (IEMO) ▪ UNISDR ▪ Hyogo Framework for Action
		1. Existence of national disaster plans/programmes	Description		
		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		
Topic 6.3.2: Preparedness for technological disasters	a.	National technological disaster preparedness and management systems			
		1. *Existence and description (e.g., number of staff) of public disaster management plans/programmes (and private when available)*	Description		
		2. *Expenditure on disaster prevention, preparedness, clean-up and rehabilitation*	Currency		

Component 6: Environmental Protection, Management and Engagement

Sub-component 6.4: Environmental Information and Awareness

Topic		Statistics and Related Information (Bold Text - Core Set/Tier 1; Regular Text - Tier 2; Italicized Text - Tier 3)	Category of Measurement	Potential Aggregations and Scales	Methodological Guidance
Topic 6.4.1: Environmental information	a.	Environmental information systems		▪ National ▪ Sub-national	
		1. Existence of publicly accessible environmental information system	Description		
		2. Annual number of visits/users of specific environmental information programmes or environmental information systems	Number		
	b.	Environment statistics			
		1. Description of national environment statistics programmes (e.g., existence, year of establishment, lead agency, human and financial resources)	Description		
		2. *Number and type of environment statistics products and periodicity of updates*	Description, Number		
		3. Existence and number of participant institutions in inter-agency environment statistics platforms or committees	Number		
Topic 6.4.2: Environmental education	a.	Environmental education			
		1. *Allocation of resources by central and local authorities for environmental education*	Currency		
		2. *Number and description of environmental education programmes in schools*	Description, Number		
		3. *Number of students pursuing environment-related higher education (e.g., science, management, education, engineering)*	Number		
Topic 6.4.3: Environmental	a.	Public environmental perception and awareness			
		1. *Knowledge and attitudes about environmental issues or concerns*	Description		

perception and awareness		2. *Knowledge and attitudes about environmental policies*	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)	Currency, number		
		2. *Number of pro-environmental activities*	Number		
		3. *Number of pro-environmental programmes*	Number		

UNIT 4 – Presentation and dissemination of Environmental Statistics

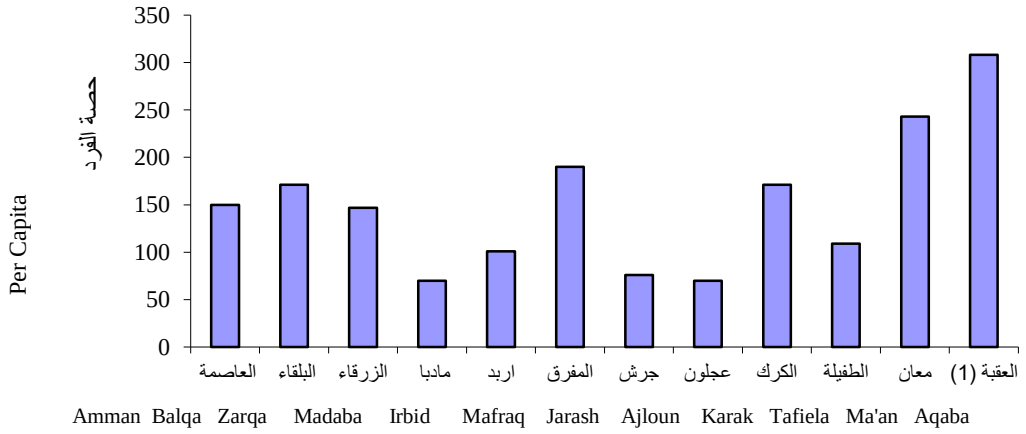
4.1. Presentation of environmental statistics in graphs

There is several ways to publish statistical data from which environmental statistics. The data in the annual report published as tables, graphs or maps.

We must take care of all details starting from the name of the table, source of the data, colors, units and the obvious of the results.

شكل 1.1.3: حصة الفرد من التزويد المائي حسب المحافظة 2012 (لتر/يوم)

Figure 3.1.1: Per Capita Water Supply by Governorate, 2012 (liter/day)



4.2. Presentation of environmental statistics in tables

One of the dissemination tools is tables. The table should have certain characteristics:

- The name of the table should address the content and give exact idea on it.
- The unit of any parameter must be written and unified.
- The content is clear and to minimum decimals.
- The source of the data must be mentioned under the table.
- The data must be grouped into different sectors and each group must contain all data available.
- Descriptive analysis for the grouped data should be written in the beginning of the chapter and indicators related to the topic.

جدول 1.2.3: كمية المياه المستخدمة حسب الإقليم والمصدر في أنشطة الفنادق والتعليم 2012 (متر مكعب**)**

Table 3.2.1: Quantity of Used Water According to Region and Source in the Hotels and Education Activities, 2012 (m^3)

Region	Economic Activity	المجموع Other	أخرى Other	مياه محلاة Desalanized Water	بئر Well	صهريج tanker	شبكة عامة Public Network	رمز النشاط ISIC	النشاط الإقتصادي	الإقليم
Central	Hotels	**3,045,816**	0	0	0	660,743	2,385,073	5510	الفنادق	الوسط
	pirmary education	**989,457**	314	316	0	255,447	733,380	8510	التعليم الاساسي	
	General Secondary Education	**553,132**	0	0	0	40,700	512,431	8521	التعليم الثانوي العام	
	Higher Education	**1,189,939**	0	87,274	332,302	42,342	728,021	8530	التعليم العالي	
	Total	**5,778,343**	314	87,590	332,302	999,233	4,358,905		**المجموع**	
North	Hotels	**14,878**	0	15	0	0	14,863	5510	الفنادق	الشمال
	pirmary education	**112,878**	0	21	4,390	21,645	86,821	8510	التعليم الاساسي	
	General Secondary Education	**10,048**	0	12	0	801	9,235	8521	التعليم الثانوي العام	

	Higher Education	**2,155,863**		103,253	1,919,581	43,998	89,032	8530	التعليم العالي	
	Total	**2,293,667**	0	103,301	1,923,971	66,444	199,951		**المجموع**	
South	Hotels	**1,284,635**	0	0	0	5,135	1,279,500	5510	الفنادق	الجنوب
	pirmary education	**36,033**	5	0	0	135	35,893	8510	التعليم الاساسي	
	General Secondary Education	**30,828**	0	0	0	0	30,828	8521	التعليم الثانوي العام	
	Higher Education	**91,191**	0	0	74,250	0	16,941	8530	التعليم العالي	
	Total	**1,442,687**	5	0	74,250	5,270	1,363,162		**المجموع**	
Total		**9,514,697**	**319**	**190,891**	**2,330,522**	**1,070,947**	**5,922,018**			**المجموع**

Source: Department of Statistics

المصدر: دائرة الإحصاءات العامة

4.3. Dissemination- What it is and why it is important

The final stage in data preparation is dissemination. Dissemination is a traditional view of communication, which involves sender and receiver. The information is sent out and received, but no reply is given. The message carrier sends out information, not to one individual but many in broad casting system as example, is advertising, public announcement and speech. The importance of this part in environmental statistics comes from fast development in the dissemination tools and ideas. One of the most important dissemination tools is data sharing. This system is increasingly developed by European Environment Agency and they advise to use it in developing countries. In Jordan, more than one information system is exist such as Water Information System, Energy Information System and Jordan Environment Information System (JEIS under construction) and statistical data bases, which will play a great role in sharing of environmental information and data bases. The user of the information systems in different institution should have permission (Focal point) and person who is responsible for providing the data should be qualified and have a permission to send the data, in order to be sure of the data quality.

Another important tool for dissemination is publishing annual book for environmental statistics. The annual has all indicators and data which are available in certain year from different resources and descriptive analysis for each sector.

The importance of the dissemination tool is coming from offering a mean of reaching wide range of readership at minimum cost or no charge. It is popular for environmental researchers to investigate in the statistics website for all kind of data and information. The information is taken and analyzed according to the objectives of the project, policy or research.

4.4. Forms for disseminating environmental statistics

1. Overview of monitoring networks and information systems

As a general remark, despites some progress in the past years, the different monitoring networks and information systems are still poorly coordinated. The issue of the lack of common spatial data reference, methodologies and definitions has been raised several times. It would allow to correct the differences identified between different sets of data. For example, the number of landfills differs from one institution to another. In the same vein, a common e-government platform would greatly facilitate the exchange of information between the relevant institutions and organizations and ensure that the data are used at a strategic level for policy development and enforcement.

DOS has long experiences with international agreed methodologies and classifications,, also DOS is the national focal point for ENPI-SEIS. The role of DOS in the information system is providing environmental data about different thematic priority areas indicators from 1995 up to date. The source of data is annual surveys and administrative registrations (this has not been described in the previous section? It is mentioned as source of data) from different concerned institutions, data disseminated to different data users by annual environmental report, DOS website. In addition, DOS plans to enhance and develop data dissemination tools but there are some challenges such as lack of adequate infrastructure and capacity building, restriction of coverage, disputes and duplications.

Working now is to construct JEIS Under the umbrella of MOEnv and DOS.

Next Year (2016) will be the construction of environmental Map contains all data and information for all available data and integrated with Social and Economic layers upon the availability of technical assistant and funds.

Concern national data custodians and from DOS point of view, the responsibility of environmental data supposed to be a national committee represented different concerned stakeholders regarding to their work nature and mandatory. For the level of geographical coverage, environmental data supposed to represent different national geographical levels based on the needs and availability of data.

2. The Jordan Info Database

The DOS manages the Jordan Info Database, which was created using the DevInfo software. It includes 222 indicators, covering 16 sectors: demographics, economics, construction, telecommunications and information, education, social security, travel, women, health, enterprises and trade unions, nutrition, energy, agriculture, housing and households, security and justice, environment. The database covers the period 2000-2009 and is based on statistical publications and results of surveys and censuses conducted by DOS. The database published on a CD and on the website of the Department of Statistics: www.DOS.gov.jo

Within We write this part in order to put more details about environmental data sources and data dissemination, it appears as redundant but actually it has more details.

3. The Web Site

Environmental data published by DOS includes data sets on quantity of municipal solid waste from economic enterprises sector, industry and household, water supply for household and municipal purposes. Data are the results of annual surveys which are available annually on the begging of the next year of the survey's year. The Environment Division is planning to resume the overall industrial survey extending it again to all industries and manufacturing activities. At present, the survey is limited to 18 hazardous industrial activities for which data on water consumption per type, sources, and waste water, along with information on energy use and waste production are provided.

Data delivery is free, on request, but it is reported annually in the environment statistics report, which could be found in the library of the Headquarter of DOS. In Addition, some of the survey results are published on the website of DOS (http://www.DOS.gov.jo/env/env_e/index.htm).The Environment Division also plans to develop water account tables (water used, produced wastewater, emissions to water and hybrid accounts by activity) linked with the National Water Information System managed by the MWI.

4. Mapping

To identify environmental layer which will be crossed with social and economic layer is the next improvement in data dissemination tools. The environmental layer must represent the location of waste and wastewater infrastructure, stationary sources of pollution (industries) with concentration of pollutant, natural resources and description and all environmental facilities.