

CHAPTER ONE

ENVIRONMENT STATISTICS: FRAME WORK AND INDICATORS

1.1 Introduction

Universally the rapid pace of economic growth has been accompanied by resource depletion and environmental degradation. Air and water pollution, water scarcity, desertification, and the depletion of natural resources are beginning to have an adverse impact on almost all forms of economic activity by causing frequent disasters such as floods and landslides, and generally diminishing the quality of life in the region. To address those problems, a broad-based program of environmental policies and regulations is needed. Such programs require that we collect and compile authentic environment data for use by government officials and other decision makers. Data relating to existing environmental conditions is crucial for environmental planning and decision making. India is in the path of a rapid economic development and will therefore need to vigorously collect and collate environment statistics.

The objective of environment statistics is to provide information about the environment, its most important changes over time and across locations, and the main factors that influence them. Ultimately, environment statistics aim at providing high quality statistical information to improve knowledge of the environment, to support evidence-based policy and decision making, and to provide information for the general public, as well as for specific user groups. Environment statistics are multidisciplinary and cross-cutting, involving numerous sources and stakeholders

Environment statistics aggregate, synthesize and structure environmental and

other data according to statistical methods, standards and procedures. It is the role of environment statistics to process environmental data into meaningful statistics that describe the state and trends of the environment and the main processes affecting them. Not all environmental data are used in the production of environment statistics. The Framework for the Development of Environment Statistics (FDES) provides a framework that marks out environmental data that fall within its scope and then structures, synthesizes and aggregates them into meaningful statistics.

The scope of environment statistics covers biophysical aspects of the environment and those aspects of the human sub-system that directly influence and interact with the environment. Within this scope, environment statistics describe the state and changes of environmental conditions, the quality and availability of environmental resources, the impact of human activities and natural events on the environment, the impact of changing environmental conditions, as well as the social actions and economic measures taken by societies to avoid or mitigate these impacts and to restore and maintain the capacity of the environment to provide the services that are essential for life and human wellbeing

Environment statistics support evidence based policy making by enabling the identification of environmental policy issues and the objective quantification of measures and impacts of policy initiatives. They strengthen assessments through quantitative metrics, making analyses more robust through the use of timely and comparable data. The type, the level of thematic, spatial and temporal aggregation and the format of

environment statistics depend on the type of the user and the intended purpose of use. The main products of environment statistics are detailed tabulated environment statistics series, environmental accounts and environmental indicators

Main uses and user groups of environment statistics

Different users need environment statistics at different levels of aggregation and depths of information. They may need cross-cutting environment statistics data sets, for instance regarding climate change. In other cases they may only be interested in particular topics and themes pertaining to specific sectoral analysis and policy making. Policy and decision makers, and the general public would tend to use environmental indicators, whereas researchers, analysts, and experts may be more inclined to look at extensive and detailed environment statistics. Environment statistics serve a variety of users, including but not restricted to:

- i. Policy and decision makers at all levels;
- ii. The general public, including media and civil society;
- iii. Analysts and researchers;
- iv. Academia; and
- v. International agencies

The field of environment statistics has no single, overarching, internationally agreed classification of the environment for statistical purposes. Instead, there are a number of coexisting and emerging classifications and categorizations for specific subject areas in environment statistics. These include standardized statistical classifications as well as less formalized groupings or categories. Some of the classifications and categories that have been used in the environmental field have not been developed specifically for

statistical purposes, and therefore have to be linked to statistical classifications

UNSD developed and published in 1984 'A Framework for the Development of Environment Statistics (FDES).' The FDES sets out the scope of environment statistics by relating the components of the environment to information categories that are based on the recognition that environmental problems are the result of human activities and natural events reflecting a sequence of action, impact, and reaction. Relevant information, therefore, refers to social and economic activities and natural events, their effects on the environment, and the responses to these effects by the society. The contents of the FDES are "statistical topics"; they are those aspects of environmental concerns that can be subjected to statistical description and analysis. It is a flexible framework that is used for developing and organizing environmental and related socio-economic information.

The scope of environment statistics include the media of the natural environment (air, water, land/soil), the biota found within these media, and human settlements. 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 impacts of these activities and events, and social responses to these impacts.

1.2 Development versus Environment Degradation

GDP and per capita income are the standard indicators for measuring the economic progress of the country. However, certain environmental functions, which are crucial for economic performance and generation of human welfare such as provision of natural resources to production and consumption

activities, waste absorption by environmental media and environmental services of life support and other human amenities, are taken into account only partly in conventional accounts. Globally, environmental degradation is manifesting itself through the loss of fertile soils, desertification, decreasing forest cover, reduction of fresh water availability, and an extreme loss of biodiversity. These are serious consequences, and it has become clear today that economic development must be environmentally sustainable. Table 1.3.2 below gives some impacts of development activities on environment.

The scarcities of natural resources now threaten the sustained productivity of the economy and economic production and consumption activities. These activities impair environmental quality by over loading natural sinks with wastes and pollutants. The environmental consequence of development tends to offset many benefits that may be accruing to individuals and societies on account of rising incomes. There are direct

costs on the health of individuals, their longevity and on quality of life on account of deterioration in environmental quality to mention a few. More importantly, the environmental damage can also undermine future attainments and productivity, if the factors of production are adversely affected. Therefore, the private and social costs of the use of the natural resources and the degradation of the environment may be taken into account for the *sustainable development* in the conventional accounts.

1.3 Environmental Indicators

List of environmental and related socio-economic indicators

The United Nations Statistical Division (UNSD) developed a list of environmental indicators in collaboration with the Intergovernmental Working Group on the Advancement of Environment Statistics. The fourth meeting of the Working Group agreed on the List of environmental and related socioeconomic indicators given below.

Table 1.3.1 Framework for Development of Environment Statistics (FDES)				
Information categories				
Agenda Issues (clusters)	A. Socioeconomic activities, events	B. Impacts and effects	C. Responses to impacts	D. Inventories, stocks, background conditions
ECONOMIC ISSUES	Real GDP per capita growth rate Production and consumption patterns Investment share in GDP	EDP/EVA per capita Capital accumulation (environmentally adjusted)	Environmental protection expenditure as % of GDP Environmental taxes and subsidies as % of government revenue	Produced capital stock

SOCIAL/ DEMO- GRAPHIC ISSUES	Population growth rate Population density Urban/rural migration rate Calorie supply per capita	% of urban population exposed to concentrations of SO ₂ , particulates, ozone, CO and Pb Infant mortality rate Incidence of environmentally related diseases		Population living in absolute poverty Adult literacy rate Combined primary and secondary school enrollment ratio Life expectancy at birth Females per 100 males in secondary school
AIR/CLIMATE	Emissions of CO₂, SO₂ and NO_x Consumption of ozone depleting substances	Ambient concentrations of CO, SO₂, NO_x, O₃ and TSP in urban areas Air quality index	Expenditure on air pollution abatement Reduction in consumption of substances and emissions	Weather and climate conditions
LAND/SOIL	Land change use Livestock per km ² of arid and semi-arid lands Use of fertilizers Use of agricultural pesticides	Area affected by soil erosion Land affected by desertification Area affected by salinization and water logging	Protected area as % of total land area	Arable land per capita
WATER Fresh water resources	Industrial, agricultural and municipal discharges directly into freshwater bodies Annual withdrawals of ground and surface water Domestic consumption of water per capita	Concentration of lead, cadmium, mercury and pesticides in fresh water bodies Concentration of fecal coliform in fresh water bodies Acidification of fresh water bodies	Waste water treatment, total and by type of treatment (% of population served) Access to safe drinking water (% of population served)	Groundwater reserves

<p>Marine water resources</p>	<p>Industrial, agricultural water use per GDP</p> <p>Industrial, agricultural and municipal discharges directly into marine water bodies</p> <p>Discharges of oil into coastal waters</p>	<p>BOD and COD in fresh water bodies</p> <p>Water quality index by fresh water bodies</p> <p>Deviation in stock from maximum sustainable yield of marine species</p> <p>Loading of N and P in coastal waters</p>		
<p>OTHER NATURAL RESOURCES</p> <p>Biological resources</p> <p>Mineral (incl. energy) resources</p>	<p>Annual roundwood production</p> <p>Fuelwood consumption per capita</p> <p>Catches of marine species</p> <p>Annual energy consumption per capita</p> <p>Extraction of other mineral resources</p>	<p>Deforestation rate</p> <p>Threatened, extinct species</p> <p>Depletion of mineral resources (% of proven reserves)</p> <p>Lifetime of proven reserves</p>	<p>Reforestation rate</p> <p>Protected forest area as % of total land area</p>	<p>Forest inventory</p> <p>Ecosystems inventory</p> <p>Fauna and flora inventory</p> <p>Fish stocks</p> <p>Proven mineral reserves</p> <p>Proven energy reserves</p>
<p>WASTE</p>	<p>Municipal waste disposal</p> <p>Generation of hazardous waste</p> <p>Imports and exports of hazardous wastes</p>	<p>Area of land contaminated by toxic waste</p>	<p>Expenditure on waste collection and treatment</p> <p>Waste recycling</p>	

HUMAN SETTLEMENTS	Rate of growth of urban population % of population in urban areas Motor vehicles in use per 1000 habitants	Area and population in marginal settlements Shelter index % of population with sanitary services	Expenditure on low-cost housing	Stock of shelter and infrastructure
NATURAL DISASTERS	Frequency of natural disasters	Cost and number of injuries and fatalities related to natural disasters	Expenditure on disaster prevention and mitigation	Human settlements vulnerable to natural disasters

TABLE 1.3.2: SOME IMPACTS OF DEVELOPMENT ACTIVITIES ON ENVIRONMENT

Development Activities	Major Impacts on Environment
Forest clearing and land resettlements	Extinction of rare species of flora and fauna, creation of condition for mosquito breeding leading to infectious diseases such as malaria, dengue etc.
Shifting cultivation in upland agriculture	Soil erosion in upland areas, soil fertility declines due to shorter cultivation cycle, which is practiced due to population pressure, flooding of low land areas. The problems could be resolved by terraced cultivation.
Agro industries	Air pollution due to burning of bagasse as fuel in sugar mills, large amount of highly polluting organic wastes, surface water pollution .
Introduction of new varieties of cereals	Reduction of genetic diversity of traditional monoculture resulting in instability, danger of multiplication of local strains of fungus, bacteria or virus on new variety
Use of pesticides	Organism develops resistance and new control methods are needed (e.g. in malaria, widespread use of dieldrin as a prophylactic agent against pests of oil palms made the problem worse), creation of complex and widespread environment problems. The pesticides used in agriculture sometimes go into food chain or in water bodies which may result in harmful health hazards.
Timber extraction	Degrades land, destroys surface soil, reduces production potential of future forests.

Urbanisation and industrialization	Concentration of population in urban centers make huge demands on production in rural areas and put pressures on land, air and water pollution.
Water resource projects, e.g. Dam, extensive irrigation	Human settlement & resettlement, spread of waterborne diseases, reduction of fisheries, siltation, physical changes e.g. temperature, humidity.

1.4 Revision of FDES

The Framework for the Development of Environment Statistics (FDES) was first published in 1984 by the United Nations Statistics Division (UNSD). The 1984 FDES and subsequent publications have been a useful framework for guiding countries in the development their environment statistics programmes. During the time since its publication there have been a number of scientific, political, technological, statistical and experience-based developments which suggested that the FDES was ready for revision.

As a consequence, the United Nations Statistical Commission, at its 41st session in February 2010, endorsed a work programme and the establishment of an Expert Group for the revision of the FDES. The members of the Expert Group represented producers and users of environment statistics of countries from all regions and at different stages of development, as well as international organizations, specialized agencies and non-governmental organizations. ADG CSO(SSD) was a member of the Expert Group.

The revision was undertaken as part of UNSD's work programme on environment statistics, supported by the Expert Group on the Revision of the FDES. The drafts were reviewed in four face-to-face meetings of the Expert Group and in several rounds of electronic

discussion. The Core Set of Environment Statistics was tested by 25 countries and two organizations. The final draft of the FDES was subjected to a Global Consultation, yielding feedback from 71 countries, areas and organizations and the FDES 2013 is the result of this wide consultation process. UN Statistical Commission at its 44th Session held in 2013 endorsed the revised framework as the framework for strengthening environment statistics programmes in countries and recognized it as a useful tool in the context of sustainable Development Goals and Post 2015 Development Agenda.

The revised FDES 2013 is a multipurpose conceptual and statistical framework that is comprehensive and integrative in nature. It provides an organizing structure to guide the collection and compilation of environment statistics and to synthesize data from various subject areas and sources. It is broad and holistic in nature, covering the issues and aspects of the environment that are relevant for analysis, policy and decision making. The FDES is structured in a way that allows links to economic and social domains. Its seeks to be compatible with other frameworks and systems, both statistical and analytical, such as for instance the System of Environmental-Economic Accounting (SEEA), the Driving force – Pressure – State – Impact – Response (DPSIR) framework, and the

Millennium Development Goals (MDGs) indicator framework. As such, the FDES facilitates data integration within environment statistics and with economic and social statistics.

The FDES 2013 sets out a comprehensive (though not exhaustive) list of statistics (the Basic Set of Environment Statistics) that can be used to measure the statistical topics relating to environment. The Basic Set is organized in three tiers, based on the level of relevance, availability of data and methodological development of the statistics.

Within this scope, a Core Set of Environment Statistics has been identified as Tier 1. The objective of the Core Set is to serve as an agreed, limited set of environment statistics that are of high priority and relevance to most countries. Harmonized international definitions, classifications and data collection methods for these statistics will be provided in subsequent methodological handbooks to facilitate their production in an internationally comparable manner.

The FDES 2013 is relevant to, and recommended for use by, countries at any stage of development. However, it is particularly useful to guide the formulation of environment statistics programmes in countries at early stages in the development of environment statistics by: (i) identifying the scope and constituent components, sub-components and statistical topics relevant for them; (ii) contributing to the assessment of data requirements, sources, availability and gaps; (iii) guiding the development of multipurpose data collection processes and databases; and (iv) assisting in the co-ordination and organization of

environment statistics, given the inter-institutional nature of the domain.

The FDES organizes environment statistics into a structure consisting of components, subcomponents, statistical topics, and individual statistics using a multi-level approach. The first level of the structure consists of six fundamental components that follow the FDES conceptual framework.

The first component brings together statistics related to the conditions and quality of the environment and their change. The second component groups together statistics related to availability and use of environmental resources (ecosystem provisioning services, land and subsoil resources). The third component includes statistics related to the use of regulating services of the environment for the discharge of residuals from production and consumption processes. Statistics related to extreme events and disasters (both natural and technological) and their impacts are covered by the fourth component. The fifth component brings together statistics related to environmental conditions and impacts within human settlements. The sixth component groups statistics relevant to societal responses and economic measures aimed at protecting the environment and managing environmental resources.

Environmental conditions and quality (Component 1) are at the centre of the FDES. The other five components have been set up based on their relationship with the central Component 1. As presented in chart 1 below, all six components are intrinsically related with each other.

Chart 1.4.1: Component of FDES 2013



Chart 1 shows the six components of the FDES. The dotted lines separating the components are an indication of the continuous interactions among them. These interactions are between and among all the components of the FDES. It should be noted that a two dimensional diagram can only provide a limited visualisation of the complex and interrelated nature of the relationships between humans and the environment.

The revised FDES uses a multi-level approach. The first level of the structure defines the six fundamental components. Each individual component is further broken down into its respective sub-components (second level) and statistical topics (third level). Each level uses numbering conventions. The final level contains the actual individual environment statistics.

The components, sub-components, statistical topics and individual statistics of the FDES define the scope and boundaries of environment statistics. They provide an organizing structure for synthesizing and presenting the information in a comprehensive, consistent and coherent manner.

Table 1.4.1: Components and Sub-components of the FDES

<p>Component 1: Environmental Conditions and Quality</p>	<p>Sub-component 1.1: Physical Conditions Sub-component 1.2: Land Cover, Ecosystems and Biodiversity Sub-component 1.3: Environmental Quality</p>
<p>Component 2: Environmental Resources and their Use</p>	<p>Sub-component 2.1: Non-energy Mineral Resources Sub-component 2.2: Energy Resources Sub-component 2.3: Land Sub-component 2.4: Soil Resources Sub-component 2.5: Biological Resources Sub-component 2.6: Water Resources</p>
<p>Component 3: Residuals</p>	<p>Sub-component 3.1: Emissions to Air Sub-component 3.2: Generation and Management of Wastewater Sub-component 3.3: Generation and Management of Waste</p>
<p>Component 4: Extreme Events and Disasters</p>	<p>Sub-component 4.1: Natural Extreme Events and Disasters Sub-component 4.2: Technological Disasters</p>
<p>Component 5: Human Settlements and Environmental Health</p>	<p>Sub-component 5.1: Human Settlements Sub-component 5.2: Environmental Health</p>

Component 6: Environment Protection, Management and Engagement	Sub-component 6.1: Environment Protection and Resource Management Expenditure Sub-component 6.2: Environmental Governance and Regulation Sub-component 6.3: Extreme Event Preparedness and Disaster Management Sub-component 6.4: Environmental Information and Awareness
---	---

India also participated in the Pilot of the Revised FDES 2013 and Global consultation during August-October 2012. The draft revised frame work was also discussed in a national workshop organised at Hyderabad in September 2012.

The Compendium of Environment Statistics will be revised in consistent with the revised UN frame work. UN Statistics Division (UNSD) is in the process of developing a work plan for its implementation. An Expert Group on Environment Statistics was established in December 2013. India is also a member of the Expert Group. The first meeting of the Expert Group was held in March 2014. . The Expert Group discussed the outline of the Methodological Manual for the Core Set of Environment Statistics. The process of adapting the revised FDES will be started after UNSD finalise the Methodological Manual and subsequent capacity development.
