

COMPENDIUM OF ENVIRONMENT STATISTICS INDIA

2011



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**CENTRAL STATISTICS OFFICE
GOVERNMENT OF INDIA**

Ministry of Statistics & Programme Implementation

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Preface

The Compendium of Environment Statistics 2011 is the twelfth edition of its series, which initially started since 1997. It broadly covers the five core parameters, viz., biodiversity, atmosphere, land/soil, water and human settlements suggested by the Framework for Development of Environment Statistics (FDES) published by United Nations Statistics Division (UNSD) in 1984. 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. Through this annual publication, CSO is trying to bring out the environment related information to the extent to which the data exhibit the pattern of changes and their magnitudes in the Indian context. It is interesting to note from the feedback from the users of the data that it had created genuine interest among planners and policy makers, industries, researchers and academia. An attempt has been made to reorient and reorganize the data without disturbing the kernel based on FDES since the eleventh edition. It is our endeavor to bring in more disaggregated information as per the requirements of the users based on the feedback received from them. The users are requested to express their views and ideas so that the same could be addressed in the ensuing issues.

I take this opportunity to express my sincere thanks to the data source agencies for their support for this issue of the publication. I hope that they may continue to do so in future too to further improve the usefulness of this publication.

Under the leadership of Smt. S. Jeyalakshmi, Additional Director General, a team of dedicated officers like Shri. V. Parameswaran, Deputy Director General, Smt. Ratna Chaudhury, Director, Shri. S. Suresh Kumar, Deputy Director, and Shri. Rajesh Kumar Panwar, Senior Statistical Officer have exhibited enormous commitment in compiling this publication.

New Delhi,

29th December, 2011.

(S. K. Das)

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CHAPTER ONE

ENVIRONMENT AND ENVIRONMENT DEGRADATION

1.1 Introduction

Environment can be defined as the physical surrounding of man/woman of which he/she is a part and on which he/she is dependent for his/her activities like physiological functioning, production and consumption. His physical environment stretches from air, water and land to natural resources like energy carriers, soil and plants, animals and ecosystems. The relationship between physical environment and the well being of individuals and societies is multi-fold and multi-faceted with a qualitative as well as a quantitative aspect to it. The availability and use of natural resources have a bearing on the outcome and the pace of development process. For an urbanized society, a large part of environment is man made. But, even then, the artificial environments (building, roads) and implements (clothes, automobiles) are based on an input of both labour and natural resources. Commonly, the term 'Environment' is restricted to ambient environment. In that view, the indoor environment (home, work place) is regarded as isolated piece of environment to be treated on its own terms.

The indoor environment usually is under the jurisdiction of the Public Health authorities. Health risks are mainly linked to space heating, cooking and lighting: low grade fuels, insufficient ventilation, and low or non-existing chimneys are often the main problems. Additionally, there may be problems connected with moist, light, incidence, hazardous substances from building materials, lacquers and paints. Problems with drinking water, sewage and waste are not linked to the dwelling as such,

but rather due to lack of appropriate infrastructure. Statistics on indoor environment may be regarded as a subset of statistics on human settlements and the urban environment.

1.2 Development versus Environment Degradation

Development activities are measured in terms of national products, which in turn are defined as production of goods and services during accounting period. 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. 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 (Stockholm, 6 - 10 February 1995) agreed on the List of environmental and related socioeconomic indicators given below. The Statistical Commission, at its twenty-eighth session (New York, 27 February - 3 March 1995), approved this list for international compilation by UNSD. The indicators that are bolded in the list were intended for short-term compilation directly from national statistical services or from other international organizations or specialized agencies.

Table 1.3.1 Framework for Development of Environment Statistics (FDES) Information categories				
Agenda 21 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		Population living in absolute poverty Adult literacy rate Combined primary and secondary school

		Incidence of environmentally related diseases		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 use change 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	Concentration of lead, cadmium, mercury and pesticides in fresh water bodies Concentration of fecal coliform in fresh water	Waste water treatment, total and by type of treatment (% of population served) Access to safe drinking water (% of population)	Groundwater reserves

<p>Marine water resources</p>	<p>Domestic consumption of water per capita</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>bodies</p> <p>Acidification of fresh water bodies</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>served)</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</p>	<p>Deforestation rate</p> <p>Threatened, extinct species</p> <p>Depletion of mineral resources (% of proven reserves)</p> <p>Lifetime of</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>

	other mineral resources	proven reserves		Proven energy reserves
WASTE	Municipal waste disposal Generation of hazardous waste Imports and exports of hazardous wastes	Area of land contaminated by toxic waste	Expenditure on waste collection and treatment Waste recycling	
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 Emissions, Discharges and their Sources

1.4.1. The environmental stress caused by developmental activities emanating

from emissions and discharges of various substances into air, water and soil. These emissions and discharges have not only local effects but regional and global effects too.

TABLE 1.4.1: LOCAL, REGIONAL AND GLOBAL EFFECTS OF POLLUTION

Local effects	Regional	Over Marine Water and Continents	Global
Heavy metals in air, soil, water and plants, e.g. From industrial emissions and Discharges Noise, Smell, Air pollution.	Eutrophication, Contaminants in the soil & water, Landscape changes due to mining or agriculture.	Eutrophication, Acidification, Environment Contamination due to Radioactivity	Changes the climate due to ozone depletion and the greenhouse effect.

1.4.2 Acidifying emissions

Sulphur dioxide and nitrogen oxides emitted into the air are converted into acids. At their deposition, they have an acidifying effect on soil and water. The emission of ammonia also contributes to the acidification. Main sources of emission of sulphur dioxide in the air are due to burning of Sulphur containing fuel like coal mine, power plants, oil by vehicles, and also due to refining of oils in refineries.

1.4.3 Emissions of volatile organic substances

Volatile organic substances may also effect health. Many of such substances are carcinogenic. In combination with nitrogen oxides and in sunlight, some of them might form ozone and other photochemical oxidants. These are harmful to plants.

1.4.4 Gases affecting the climate

The greenhouse gases (carbon dioxide, methane etc.) prevent some of the heat radiation from the earth into space. The concentration of green house gases is responsible for raising the temperature of the earth in a long term. Eighty percent of the effect of the greenhouse gases is caused by carbon dioxide itself.

1.4.5 Eutrophicating discharges into water

Nutrients, mainly nitrogen and phosphorus, contribute to the eutrophication of lakes, rivers and marine waters. Approximately, half of the nitrogen discharges are estimated to originate from agricultural land. A considerable proportion of the phosphorous discharge derives from waste water not passing through sewage treatment plants. In addition to discharges

from human activities, there is a natural leaching from various types of soil. The quantities are estimated to be of about the same magnitude as those originating from human activities.

1.4.6 Emissions of heavy metals

Discharges and emissions of heavy metals are difficult to estimate. A large proportion of emissions/discharges of

heavy metals into air originates from the iron and steel industry. Vehicular traffic is the main source of lead emissions. Mines and mining wastes account for the major part of the discharges of heavy metals into water. Besides, Cadmium depositions originate from commercial fertilizers containing phosphorus.

TABLE 1.4.2: SOME MAJOR POLLUTANTS AND THEIR SOURCES

Pollutant	Source
Carbon monoxide	Incomplete fuel combustion (e.g. two/four stroke engines)
Sulphur dioxide	Burning of sulphur containing fuel like coal in Power Plants and emission by vehicles
Suspended particulate matter	Smoke from domestic, industrial and vehicular sources.
Oxides of nitrogen	Fuel combustion of motor vehicles, emission from power stations and industrial furnaces
Volatile hydrocarbons	Partial combustion of carbonaceous fuels (two stroke engines, industrial processes, disposal of solid wastes).
Oxidants and ozone	Emissions from motor vehicles, photochemical reactions of nitrogen oxides and reactive hydrocarbons
Lead	Emissions from motor vehicles

TABLE 1.4.3: POLLUTANTS AND THEIR RELATED HEALTH HAZARDS

Pollutants	Health Effects
Carbon Monoxide (from gasoline cars, 2-wheelers, 3-wheelers)	Fatal in case of large dose: aggravates heart disorders; effects central nervous system; impairs oxygen carrying capacity of blood
Nitrogen Oxides (NO _x) (from diesel vehicles)	Irritation of respiratory tract

Ozone	Eye, nose and throat irritation; risk asthmatics, children and those involved in heavy exercise
Lead (from petrol vehicles)	Extremely toxic: effects nervous system and blood; can impair mental development of children, causes hypertension
Hydrocarbons (mainly from 2-wheelers and 3-wheelers)	Drowsiness, eye irritation, coughing
Benzene	Carcinogenic
Aldehydes	Irritation of eyes, nose and throat, sneezing, coughing, nausea, breathing difficulties; carcinogenic in animals
Polycyclic Aromatic Hydrocarbons PAH (from diesel vehicles)	Carcinogenic

1.4.7 Health Aspects of Water Quality

Water borne diseases are single most important factor responsible for nearly 80% of human mortality in India. Children are

worst affected, especially in rural areas and urban slums. Typical water born diseases and their causative factors are summarised in the Table 1.4.4.

TABLE 1.4.4: WATER BORN DISEASES AND THEIR CAUSATIVE FACTORS

Name of the Disease	Causative Organism
1. Water-borne diseases Bacterial <ul style="list-style-type: none"> ➤ Typhoid ➤ Gastroenteritis ➤ Paratyphoid ➤ Cholera ➤ Bacterial dysentery 	Salmonella typhi Vibrio cholerae Shigella paratyphi Enterotoxigenic Escherichia coli Variety of Escherichia coli
Viral <ul style="list-style-type: none"> ➤ Infectious hepatitis ➤ Poliomyelitis ➤ Diarrhea Diseases ➤ Other symptoms of enteric diseases 	Hepatitis-A-virus Polio-virus Rota-virus, Norwalk agent, Other virus Echo-virus, Coxsackie-virus
Protozoan Amoebic dysentery	Entamoeba histolytica

<p>2. Water-washed diseases</p> <ul style="list-style-type: none"> ➤ Scabies ➤ Trachoma ➤ Bacillary dysentery 	<p>Various skin fungus species Trachoma infecting eyes E. coli</p>
<p>3. Water-based diseases</p> <ul style="list-style-type: none"> ➤ Schistosomiasis ➤ Guinea worm 	<p>Schistosoma sp. Guinea worm</p>
<p>4. Infection through water related insect vectors</p> <ul style="list-style-type: none"> ➤ Sleeping sickness ➤ Malaria 	<p>Trapanosoma through tsetse fly Plasmodium through Anaphelis</p>
<p>5. Infection primarily due to defective sanitation</p> <ul style="list-style-type: none"> ➤ Hookworm 	<p>Hook worm, Ascaris</p>

CHAPTER TWO

DEVELOPMENT OF ENVIRONMENT STATISTICS IN INDIA

2.1 Introduction

The whole world has now realized the threat to its precious environment due to depletion of natural resources and the growing pace of degradation of the environment. Environmental issues, which have been for a long time part of Indian thought and social processes, are reflected in the Constitution of the Republic of India adopted in 1950. The Directive Principles of State policy, an integral and significant element of constitution of India, contain provisions, which reflect the commitment of the State to protect the environment with regard to forests and wildlife and which join upon the citizens of India the special responsibility to protect and improve the environment. The foundation of the present day institutional framework for environmental programmes in India goes back to the 1970s with the establishment of the National Committee of Environmental Planning and Coordination immediately after the historic Stockholm Conference on Environment held in 1972. The Committee was gradually upgraded into a Department of Environment in 1980 and five years later to a full-fledged Ministry of Environment and Forests (MOEF) of the Government of India (GOI). The State Governments also followed this example by establishing their own Departments of Environment to address the rapidly increasing policy initiatives and programmes in the environment and forests sectors.

Ministry of Environment and Forests has engaged itself in the task of managing country's environment by focussing on the development of important administrative tools and techniques, impact assessment, research and collection and dissemination of environmental information. However, environment being a multi-disciplinary

subject involving complex subjects like Biodiversity, Atmosphere, Water, Land and Soil and Human Settlements, it seemed difficult to collect and analyse data on these parameters and develop interrelationships among them. It, therefore, became necessary to develop an efficient statistical system on environment that could meet the growing demand of data on various aspects of environment by the various governmental agencies, environmentalists and general public.

2.2 Setting up of Environment Statistical Unit in Central Statistical Organisation

Recognising the importance of Environment Statistics as an emerging area, the subject was first discussed in the fifth Conference of Central and State Statistical Organisation (COCSSO) held at New Delhi in 1981. The Conference recommended the need for developing an appropriate environment statistical system in the country. The subject was again discussed in the Sixth and Seventh Conferences of Central and State Statistical Organisation. On the recommendation of the Seventh Conference of Central and State Statistical Organisation held in 1985, a multidisciplinary working group comprising Department of Environment, Central Statistical Organisation (CSO), State Directorates of Economics and Statistics, and other concerned Central and State organisations and research institutions involved in the related subjects, was set up in CSO under the Chairmanship of its Director General in July, 1986. The Working Group in its Report submitted in 1990 suggested a provisional list of variables for Framework for Development of Environment Statistics. The group also suggested a few variables on

which data needed to be collected on priority basis.

During the second half of 1996, a Steering Committee on Environment Statistics under the chairmanship of Director General, Central Statistics Office was constituted. In its first meeting held in January 1997, a draft framework for the development of environment statistics was discussed along with the table formats to be used for preparing the compendium. The data source agencies were identified and it was decided to hold a workshop cum second meeting of the Steering Committee to discuss draft compendium of environment statistics. The workshop cum second meeting was held at Pune in March 1997. As per the recommendations of the second meeting, the said draft compendium was modified and finally got approved in the third meeting of the Steering Committee held in August 1997.

2.3 Compendium of Environment Statistics

The Central Statistics Office brought out eleven issues of the publication entitled "Compendium of Environment Statistics" for the years 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2006, 2007, 2008-09 and 2010 presenting available data relating to environment of the country. The present issue is twelfth in its series covering the data upto 2011. The issues for the years 2004 & 2005 could not be brought out due to unavoidable circumstances. The tenth issue was a combined issue for 2008 and 2009. Although, the present coverage of information in the compendium may not be exhaustive with respect to entire domain of Environment, it does however provide a glimpse of the present scenario of the environmental degradation, its causes and the reasons for concern. It provides the necessary base to bring out the magnitude of

the problem. The compendium consists of seven chapters. The first two chapters give a general introduction to environment, its degradation through different sources and their impact on human health and the development of environment statistics in India. The remaining five chapters are on Biodiversity, Atmosphere, Land/soil, Water and Human Settlements. Besides, statistical tables depicting environment data, suitable graphs and charts have also been added to make the publication more user friendly.

2.4 National Workshop/Seminars on Environment Statistics

To disseminate information on the development of environment statistics in India and provide a forum for interaction between users and producers, ten National Workshops/ Seminars on Environment Statistics have been organised so far since 1998. The first one was organized on different aspects of Environment and its impact on land and soil degradation, health including data gaps in different sectors of environment in Goa during 12-13 January, 1998, the second one was held during 6-7 April, 2000, at Hyderabad, the third one was organised during 8-9 February, 2001 at Thirurananthapuram and the fourth one was held during 22-23 April, 2003 at Shillong. Thereafter as per the recommendations made in third workshop, it was decided to organise Seminar on sector specific subject. The fifth Seminar on Statistical Accounting of Water Resources was organised during 24-25 June, 2005 at Institute for Social and Economic Change (ISEC) Bangalore and sixth Seminar on Statistical Accounting of Land and Forestry Resources was organised during 29-30 April, 2006 at Indian Institute of Forest Management(IIFM), Bhopal. A brainstorming Workshop on Development of National Disaster Statistical System in India was organised by CSO in

collaboration with National Institute of Disaster Management (NIDM) on 27th April, 2007 at NASC, Complex Pusa, New Delhi. A Dissemination Seminar to discuss the finding and other methodological issues in respect of the completed Natural Resource Accounting studies was organised at Shimla during 17-18 December, 2007. CSO in collaboration with Institute for Climate Change (ISEC) had organised another two day's National Seminar on 'Climate Change: Data Requirement and Availability' during 16-17 April, 2009 at ISEC, Bangalore. The two day Workshop for the DESs held at New Delhi on 21-22 July 2010 discussed 'Disaster Management Statistics'. Another Workshop conducted on 21-22 August 2010 at New Delhi in collaboration with M/o Environment and Forests and WWF to explore the possibilities of environment data flow between CSO and Envis Centres. A national seminar on 'Environmental Pollution : Data Availability and Gaps' was conducted at Institute of Development Studies (IDS), Jaipur during 24-25 March, 2011. A three day Workshop on 'Disaster Management Statistics' was jointly organised with National Institute of Disaster Management (NIDM) New Delhi during 21-23 September, 2011 at National Academy of Statistical Administration (NASA), Greater Noida by inviting participants from DESs, State Disaster Management Commissioners, and the Central Ministries. All the workshops were attended by academicians, data users, and data producing agencies. The technical sessions focussed on different aspects of the environment such as environment statistics, population and human health, status of databases on different types of pollution, status of data bases on human settlements and impacts on other aspects of the environment; status of data base on land and soil and degradation; and natural resource

accounting. Proceedings of the National Workshops/Seminars are brought out regularly.

2.5 Training on Environment Statistics

Environment statistics being a multi-disciplinary emerging subject, the Statisticians working both at the Centre as well as State Governments are required to be fully familiar with the relevant terminologies, and concepts and definitions. To fulfil this need, the C.S.O. organized an International Training Programme on Environment Statistics during 27 Jan-6 Feb, 1998 with financial support from Asian Development Bank. Twenty-two participants from South and South East Asia, including nine from India, participated in this programme. The second such training programme was organized at Hyderabad during December, 2000 and the third one again at Hyderabad during April, 2001. The fourth training was organised at Jadavpur University in 2002. Two training programmes on Environment Statistics were organised in the year 2003 at EPTRI, Hyderabad and at NEHU, Shillong. The sixth training programme was organised at NEHU in the year 2004. The seventh training Programme was organised in 2005 at EPTRI, Hyderabad. The eighth and ninth training programme on Environment Statistics was organised at IIFM, Bhopal in 2006 and 2007. The tenth training on Environment Statistics was organised at EPTRI, Hyderabad in 2008.

2.6 Natural Resource Accounting

The economy draws inputs from the environment. These consist of natural resources, both non-renewable and renewable including mineral resources,

timber and non-timber forest produce, aquatic resources, and also the ecosystem services *viz.* recycling of nutrients and supply of clean air and water necessary for sustaining life. Besides, economy also uses the environment as a sink for dumping unwanted wastes generated in industrial and other anthropogenic activities.

The conventional accounting [System of National Accounting (SNA)] though operates in natural environment, hardly takes into account the environmental components and the goods and services they contribute to the economic development. Rather, it is entirely based on monetary considerations, which if dealt in isolation may prove disastrous, both to the economy as well as to the environment. Hence, links between economy and environment have to be properly understood and appreciated in order to achieve sustainable development of the society. There is an urgent need to generate data on environmental goods and services and their valuation in economic terms, so that information generated can be used for proper policy formulation to achieve overall sustainable development of the society.

As a result, concept of Integrated Environmental and Economic Accounting (IEEA) has emerged on the initiative of the United Nations. The main objectives of integrated environmental accounting are segregation and elaboration of all environmental and economic accounts, linkages of physical resource accounts with monetary environmental accounts and balance sheets, assessments of environmental costs, benefits and accounting for the maintenance of the tangible wealth. It is, thus, a complete accounting procedure for environmental assets. The IEEA later revised and termed by the City Group formed by UNSD

namely, London Group as “System for Environmental and Economic Accounting” (SEEA) taking into consideration the contributions of the environment to the economy and the impacts of the economy on the environment.

The United Nations, the European Commission, the International Monetary Fund, the Organisation for Economic Co-operation and Development and the World Bank undertook jointly the task of revision of the United Nations handbook of National Accounting-Integrated Environmental and Economic Accounting (commonly referred to as SEEA- 2003). Much of the work was done by the London Group on Environmental and Natural Resources Accounting, through a review process that started in 1998. SEEA 2003 provides a common framework for economic and environmental accounting, permitting a consistent analysis of contribution of environment to the economy and of the impact of the economy on the environment. It is intended to meet the needs of policy makers by providing indicators and descriptive statistics to monitor the interaction between the economy and the environment as well as serving as a tool for strategic planning and policy analysis to identify more sustainable development paths.

However, data on environmental components and the goods and services rendered by them, and their valuation in economic terms required for Environmental Accounting are lacking in various areas like Land, Water, Air, Energy, Agriculture, Forest, Mining, Industry etc. At present, in the fast changing environmental and economic scenario, data pertaining to various natural resources are highly desirable for proper policy formulation for sustainable development.

2.7 Natural Resource Accounting in India

The field of Environmental Accounting of Natural Resources in India is in developing stage. Various works done by experts on methodology of generating data and adding values to it (Chopra and Kakekodi, 1997; Parikh and Parikh, 1997; Kakekodi, 2002) have given valuable inputs for development of the area. **The entire process of Environmental Accounting of Natural Resources involves three steps viz. Physical accounting; Monetary valuation; and Integration with Economic Accounting.** Physical accounting determines the state of the resources types and extent (qualitative and quantitative) in spatial and temporal terms. Once the physical account of resources is available, monetary valuation is done to its all-tangible and intangible components. Thereafter, the net change in natural resources in monetary terms is integrated into the Gross Domestic Product in order to reach the value of Green GDP of a nation/state/region. The process does not require any change in the core system of SNA, rather it is achieved by establishing linkages between the two. A pilot project on Natural Resource Accounting in Goa was initiated by CSO in 1999-2000. A Technical working Group on Natural Resource Accounting constituted in the Ministry of Statistics & Programme Implementation held its first meeting in November 1997. Following the deliberations, a concept paper was got developed which was considered by the Technical Working Group in its meeting held in September 1998. The Group recommended that scope of study would be to cover all sectors of the economy. However, major emphasis would be given to Forests and Biodiversity, Minerals, Marine Resources, Tourism and Energy. In

the first phase, the Natural Resource Accounting would be attempted with the available secondary data and the gaps and requirement of additional primary data to be collected would be identified.

The first phase started in April 1999. The project was implemented by TERI under close supervision of Directorate of Planning, Statistics and Evaluation, Government of Goa. The findings of the study generated a lot of discussion in the National Statistical Commission, which, inter-alia, recommended replication of the Goa (Phase-I) project in other States also.

In order to develop sector-wise uniform methodology for natural resource accounting, the Ministry had commissioned eight studies on NRA to specialised institutes as follows:-

- (i) Mining Sector for the States of West Bengal and Madhya Pradesh to The Energy and Resources Institute (Delhi)
- (ii) Air and water Sector for Andhra Pradesh and Himachal Pradesh to Institute of Economic Growth (Delhi)
- (iii) Natural Resource Accounting in Karnataka: A Study of the Land and Forestry Sector (Excluding Mining) to Centre for Multi Disciplinary development Research (Karnataka)
- (iv) Natural Resource Accounting for Land and Forestry Sectors (excluding mining) in the States of Madhya Pradesh and Himachal Pradesh to Indian Institute of Forest Management (Bhopal)
- (v) Environmental Accounting of Land and Water Resources in Tamil Nadu to Madras School of Economics (Chennai)
- (vi) Environmental Accounting of Natural Resources of Meghalaya to North Eastern Hill University (Shillong)

(vii) Natural Resource Accounting for West Bengal for the Sectors: Air and Water to Jadavpur University (Kolkata)

(viii) Natural Resource Accounting in GOA Phase-II under SEEA Framework to Integrated Research and Action for Development (Delhi).

The reports of the eight studies on Natural Resource Accounting have been finalized. Based on these studies, technical papers for forestry sector on methodology, data requirement, filling up of identified data gaps for Natural Resource Accounting (NRA) have been prepared. In 2010, a study has been awarded to Centre for Economic and Social Studies (CESS), Hyderabad to prepare a synthesis report of the 8 studies conducted by CSO and suggest a methodology which is applicable to India. The first phase of the project is completed and the synthesis report has already been submitted by CESS. The final report is expected by March, 2012. A Technical Advisory Committee (TAC) under the Chairmanship of Dr. Kirit Parikh, Ex-Member, Planning Commission was constituted to monitor and guide the project.

An 'Expert Group on Green National Accounting' was constituted in August, 2011 under the Chairmanship of Prof. Sir Partha Dasgupta, Professor Emeritus, Cambridge University, UK with a mandate to (a) to develop a frame work for 'Green National Accounts' for India keeping in view of the previous work done on the subject, including the findings of the studies award to CESS, Hyderabad, (b) to identify the data requirements for the implementation of the recommended framework, and (c) to develop a road map for the implementation of the framework. The first meeting of the Group was held on 23rd August, 2011.

As per the recommendations of 16th COCSSO, an Expert Committee on Climate Change Statistics has been constituted by the CSO in 2009 to identify the indicators that are affecting climate change, adaptation and mitigation and examine the availability of data with a view to develop database on Climate Change Statistics. The Expert Committee constituted on Climate change data base has submitted their report during June 2010.

ABBREVIATIONS

ASI	Annual Survey of Industries	NO ₂	Nitrogen Dioxide
BSI	Botanical Survey of India	NO ₃	Nitrate
CEA	Central Electricity Authority	NSFP	National Social Forestry Project
CFC	Chloro-Floro-Carbons	ODP	Ozone Depletion Potential
CO	Carbon Monoxide	PM	Particulate Matter
CH ₄	Methane	ppm	Parts per Million
Cl	Chlorine	ppbv	Part per Billion by Volume
CPCB	Central Pollution Control Board	ppmv/year	Parts per Million by Volume per year
Cu.m	Cubic Metre	Pb	Lead
Fe	Iron	ppmv	Part per Million by Volume
GWP	Global Warming Potential	pptv	Part per Trillion by Volume
GOI	Government of India	Rs.	Rupees
H ₂ S	Hydrogen Sulphide	RSC	Residual Sodium Carbonate
ha	Hectares	SAR	Sodium Absorption Ratio
HC	Hydro Carbons	SFP	Social Forestry Project
IQ	Institutional Qualified	SO ₂	Sulphur dioxide
Kms	Kilometers	SO ₄	Sulphate
M.C.M.	Million Cubic Metre	SP	Sodium Percentage
Mg	Magnesium	SPM	Solid Particulate Matter
Mha	Million Hectares	SWS	Sub-Water Shed
MOEF	Ministry of Environment and Forests	RSPM	Residual Suspended Particulate Matter
MW	Megawatts	Sq. Kms.	Square Kilometers
NA	Not Available	TDS	Total Dissolved Solids
Neg.	Negligible	TERI	The Energy Resources Institute
NH ₃	Ammonia	WB	World Bank
NIQ	Non-Institutional Qualified	ZSI	Zoological Survey of India
NO _x	Oxides of Nitrogen	BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand	TSP	Total Suspended Particulate
μg	Microgram	m	Meter

Concepts and Definitions of the Terms Used

Area under miscellaneous tree crops, groves, etc.:

All culturable land which is not included under 'net area sown' but is put to some other agricultural use, such as land under casuarina trees, thatching grasses, bamboo bushes, and other groves for fuel, etc.

Barren and unculturable land:

Land which cannot be brought under cultivation unless at high cost, irrespective of whether such land is in isolated blocks or within cultivated holdings.

Critical:

A taxon is critical when it is facing an extremely high probability of extinction in the wild in immediate future.

Crown cover:

The canopy formed by the crowns of all the trees in a forest or in an uneven aged forest by the crowns of all trees in a specified crowns class.

Culturable waste:

Land available for cultivation but not taken up for cultivation or abandoned after a few years for one reason or the other. Such lands may be either fallow or covered with shrubs and jungles not put to any use. These may be assessed or unassessed and may lie in isolated blocks or within cultivated during the year and the last five or more consecutive years in succession, will be included in this category.

Current fallow:

Cultivable area kept fallow during the current agricultural year. Any seedling

area in the current agricultural year not cropped in the same year is also treated as current fallow.

Demersal:

Refers to fish that live on or adjacent to the sea bottom.

Dense Forest:

Forests whose crown density is 40 percent or above.

Endangered:

Species in danger of extinction and whose survival is unlikely if the casual factors continue operating. Included are species whose numbers have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Expectation of Life at Birth:

The Expectation of life at birth is defined as the average number of years expected to be lived at the time of birth if current mortality trends were to continue.

Extinct:

Species that are no longer known to exist in the wild after repeated searches of the type in localities and other known or likely places.

Flush system latrine:

The type of latrine which is connected to an under ground sewerage system, from which human excreta and wastes are flushed out by water.

Forest:

Includes all actually forested area on the lands so classed or administered as

forests under any legal enactment dealing with forests, whether state-owned or private.

Gross area irrigated:

An irrigated plot growing crop in more than one season, is counted as many times as it is cropped to arrive at gross area irrigated. In case of mixed crops, the area under component crops as reported by household is taken into account.

Habitat:

An area and not a particular location is called habitat. The site or environment which a plant or animal lives, such as forest.

Household:

A household is a group of persons who commonly live together and would take their meal from common kitchen unless the exigencies of work prevented any of them from doing so. There may be a household of persons related by blood or a household of unrelated persons or having a mix of both. Examples of unrelated households are boarding houses, messes, hostels, residential hotels, rescue homes, jails, ashrams, etc. These are called “Institutional Households”.

Infant Mortality Rate:

Infant mortality rate is defined as the number of deaths under one year of age to thousand live births in a year.

Insufficiently Known:

A taxon is insufficiently known when an evaluation has been made but the available data are inadequate to assign a category.

Irrigation:

A device of purposely providing land with water other than rain water by artificial means.

Land put to non-agricultural uses:

Includes all land occupied by buildings, paths, etc. or under water (e.g. tank, canals, etc.) and land put to uses other than agricultural production.

Neretic :

The part of the pelagic environment that extends from the nearshore zone out to depth of about 200 m; the water overlying the continental shelf related to shallow water on the margin of the sea, generally that overlying the continental shelf.

Net area irrigated:

The total of all the areas irrigated from different sources, counting each area irrigated only once even though it was irrigated more than once in the same year.

Net area sown:

Area sown with crops and orchards, counting the area sown more than once in the same year, only once.

The above definition was elaborated as follows:

The net area sown was defined as the difference between the total geographical area of all plots of land of the holding and the sum of the areas of land under

- (1) forest, (2) barren & uncultivable wastes, (3) put to non-agricultural uses, (4) culturable wastes, (5) permanent pastures & other grazing land, (6) miscellaneous tree crops excluding orchards and (7) all type of fallow lands.

Open Forest:

Forest whose crown density is more than 10 percent but less than 40 percent.

Other fallow:

All lands which are taken up for cultivation in the past, but are temporarily out of cultivation for a period of not less than one year and not

more than five years including the current agricultural year are classified under 'other fallow'.

Pastures and grazing land:

Include all grazing lands irrespective of whether they are permanent pastures and meadows or not. Grazing lands within forest area shall be included under this category.

pH:

The logarithm to the base 10 of the reciprocal of Hydrogen ion concentration.

Rare:

The species with small world populations that are not at present endangered or vulnerable but are at risk. These species are usually localised within restricted geographic areas or habitats or are thinly scattered over a more extensive range.

Room:

Covered space enclosed by walls on all sides reaching from the floor to the roof and having a door way. The rooms have been further classified as NBO rooms (specification for a room as recommended by the National Buildings Organisation) and other rooms. An NBO room is defined as a room having a floor space of at least four square metres and height of at least two metres from the floor to the ceiling.

Service latrine:

The types of latrine which are attended by the scavenging services of the Municipalities or Corporations.

Slum:

A slum is defined as an areal unit having twenty five or more kachcha structures mostly of temporary nature, or fifty or more households residing mostly in kachcha structures, huddled together, or inhabited persons with practically no private latrine and inadequate public latrine and water facilities.

Species:

A group of individual specimens having close resemblance but differing from others and belonging to the same genus.

Tap:

Source through which the drinking water is distributed through pipes laid out by corporations, municipalities or other local authorities like metropolitan or town development authorities or housing estates or similar agencies. But drinking water distributed through pipes by the house owner by pumping out from unprotected wells, tanks or springs should not be regarded as tap.

Type of dwelling:

Dwellings, have been classified under three categories, namely, chawl/bustee, independent house and flat.

(a) Chawl/Bustee:

A collection of poorly built katcha or semi-pucca huts or tenements.

(b) Independent house:

A separate structure with a room or rooms and having all its accessories and a separate entrance to it. In other words, if the dwelling unit and the entire structure of the building are physically coterminous, it should be considered an independent house.

(c) Flat:

All housing arrangements other than chawl/bustee and independent house are to be taken as flats. Flat thus includes any self-contained dwelling unit with a room or rooms provided with normal housing facilities like water supply, bath and latrine used exclusively by the family residing there or jointly with other families. It also includes detached room or rooms with or without other housing facilities.

Type of structure:

The structures have been classified into three categories, namely pucca, semi-pucca and kachcha on the basis of the materials used for construction.

(a) Pucca Structure:

A structure whose walls and roof at least are made of pucca materials.

(b) Kachcha Structure:

A structure which has walls and roof made of non-pucca materials.

(c) Semi-Pucca Structure:

A structure which has either the walls or the roof, but not both, made of pucca materials. Walls/roof made partially of pucca materials will be regarded as kachcha walls/roof. Materials such as oven-burnt bricks, stone, stone-blocks, cement, concrete, jack-board (cement plastered reed), tiles and timber are pucca materials. Corrugated iron or asbestos sheets used in the construction of roof will also be treated as pucca materials.

Urban:

The criteria adopted for treating the urban for 1991 census is:

All statutory towns, i.e., all places with a municipality, corporation, cantonment board or notified town area committee, etc.

(a) All places which satisfied the following criteria:

- (i) A minimum population of 5000;

- (ii) At least 75% of the male working population engaged in non-agricultural pursuits; and
- (iii) A density of population of atleast 400 per sq. km. Mile (1000 per sq. mile).

Urban Agglomeration:

- (i) A city or a town with a continuous outgrowth, the outgrowth being outside the statutory limits but falling within the boundaries of the adjoining villages ; or
- (ii) Two or more adjoining towns with their outgrowths, if any, as in (i) above ; or
- (iii) A city and one or more adjoining towns with or without outgrowths all of which form a continuous spread.

Vulnerable:

The species believed likely to move into the endangered category in the near future if the casual factors continue operating. Included are species of which most or all the populations are decreasing because of overexploitation, extensive destruction of habitat or other environmental disturbance; species with populations that have been seriously depleted and whose ultimate security is not yet assured; and species with populations that are still abundant but are under threat from serious adverse factors throughout their range.

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METHODS OF MEASUREMENT OF AIR POLLUTION

Methods of measurement of air pollution followed by the Central Pollution Control Board are as follows:

A. Sulphur dioxide (SO₂)

The SO₂ is absorbed from air in a solution of potassium tetrachloromercurate (TCM). The resultant complex is made to react with pararosaniline and formaldehyde to form the coloured pararosaniline methylsulphonic acid, the absorbance of this solution is measured by means of a suitable spectrophotometer at 560 nm.

B. Nitrogen dioxide (NO₂)

The NO₂ in ambient air is collected by bubbling it through a solution of sodium hydroxide and sodium arsenate. The resultant nitrite ion concentration is colorimetrically determined by reacting it with sulfanilamide and N- (1-naphthyl)-ethylene diamine dihydrochloride, the absorbance is then measured at 540 nm.

C. Suspended Particulate Matter (SPM)

SPM is measured gravimetrically high volume sampling with whatman filter paper is used at average flow rate being not less than 1.1 cubic meter per minute.

Source: Ambient Air Quality – Status and Statistics, 1997, Central Pollution Control Board, Delhi

Appendix 5

Methods of Determination of Water Quality Parameters

Parameter	Recommended Method
1. Temperature	Thermometric method
2. pH	Electrometric method
3. TSS	Nephelometric method
4. Velocity of Flow	1) Current method 2) Float method 3) Chemical method
5. Dissolved Oxygen	Iodometric method
6. Biochemical Oxygen Demand	Dilution method
7. Total Kjeldahl Nitrogen	a) Digestion b) Distillation 1) Titration method (>5mg/l) 2) Nesslerization method (<5mg/l)
8. Nitrogen, nitrate + nitrite	Amalgamated Cadmium Reduction method for reduction of nitrate to nitrite by diazotisation method
9. Total Coliform (MPN)	Multiple Tube Dilution technique
10. Fecal Coliform (MPN)	Multiple Tube Dilution technique
11. Conductivity	Conductometric method
12. Chloride*	1) Argentometric method 2) Mercurimetric method
13. Hardness	EDTA Titrimetric method
14. Calcium	EDTA Titrimetric method
15. Magnesium	By difference of 13 & 14
16. Alkalinity	1) Electrometric method 2) Visual titration method

Parameter	Recommended Method
17. Sulphate**	Turbidimetric method
18. Sodium	Flame photometric method
19. Chemical Oxygen Demand	Dichromate reflux method
20. Total Dissolved Solids &	Gravimetric method
21. Fixed Dissolved Solids	
22. Phosphate	Molybdate method (Colorimetry)
23. Boron	Curcumine method (Colorimetry)
24. Free Ammonia	

Source: Water Quality - Status & Statistics (1996 & 1997)
Central Pollution Control Board

Argentometric method has been given first preference but if the colour of the sample interferes with the chromate end point then mercurimetric method should be used. Usually sulphate concentration is

low in surface waters & hence gravimetric method may not be accurate as turbidimetric method, therefore, turbidimetric method is suggested.

Note: Wherever more than one methods are given, they are in order of preference.

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low in surface waters & hence gravimetric method may not be accurate as turbidimetric method, therefore, turbidimetric method is suggested.

Note: Wherever more than one methods are given, they are in order of preference.

METHODOLOGY FOR ESTIMATION OF POVERTY LINES

The Planning Commission as the Nodal agency in the Government of India for estimation of poverty has been estimating the number and percentage of poor at national and state levels. Since, March 1997 it has been using the Expert Group Method (Expert Group on Estimation of Proportion and Number of Poor) to estimate poverty. According to this method the estimates of poverty are made from the large sample survey data on household consumer expenditure conducted by the National Sample Survey Organization (NSSO) of the Ministry of Statistics and Programme Implementation. Using this methodology the Planning Commission, in the past, has released poverty estimates for the year 1973-74, 1977-78, 1983, 1987-88 and 1993-94 by the Government of India, Press Information Bureau on 11th March 1997. Subsequently, the poverty estimates for 1999-2000 were released by the Government of India, Press Information Bureau on 22nd February 2001. While releasing the estimates of poverty for 1999-2000, it had been noted that these estimates were not strictly comparable with the estimates for the previous years.

2. The state-wise rural and urban poverty lines for the year 2004-05 are estimated using the original state-specific poverty lines identified by the Expert Group and updating them to 2004-05 prices using the Consumer Price Index of Agricultural Labourers (CPIAL) for rural poverty lines and Consumer Price Index for Industrial Workers (CPIIW) for urban poverty lines.

3. The NSSO has now released the result of the latest large sample survey data on household consumer expenditure (NSS 61st Round), covering the period July 2004 to June 2005 [Report No.508 (61/1.0/1)]. From this data, two different consumption distributions for the year 2004-05 have been obtained. The first one from the consumption data collected using 30-day recall period (also known as reference period) for all the items. The other distribution is obtained from the consumer expenditure data collected using 365-day recall period for five infrequently purchased non-food items, namely, clothing, footwear, durable goods, education and institutional medical expenses and 30-day recall period for the remaining items. These two consumption distributions have been termed as Uniform Recall Period (URP) consumption distribution and Mixed Recall Period (MRP) consumption distribution respectively. The Planning Commission, using the Expert Group methodology has estimated poverty in 2004-05 using both the distributions.

4. The state specific percentage and number of poor in rural and urban areas estimated from URP consumption distribution. The state specific percentage and number of poor in rural and urban areas are estimated from MRP consumption distribution.

5. The percentage and number of poor in 2004-05 estimated from URP consumption distribution of NSS 61st Round of consumer expenditure data are comparable with the poverty estimates of 1993-94. The percentage and number of poor in 2004-05 estimated from MRP consumption distribution of NSS 61st Round of consumer expenditure data are roughly (but not strictly) comparable with the poverty estimates of 1999-2000.

6. The URP-consumption distribution data of the 61st Round yields a poverty ratio of 28.3 percent in the rural areas, 25.7 percent in the urban areas and 27.5 percent for the country as a whole in 2004-05. The corresponding figures obtained from the MRP-consumption distribution data of the 61st Round are 21.8 percent in the rural areas, 21.7 percent in the urban areas and 21.8 percent for the country as a whole.

7. The poverty estimates in 2004-05 based on URP consumption distribution (27.5 percent) is comparable with the poverty estimates of 1993-94, which was 36 percent. (Table-1)

The poverty estimates in 2004-05 based on MRP consumption (21.8 percent) is roughly (but not strictly) comparable with the poverty estimates of 1999-2000, which was 26.1 percent. (Table-2).

Table1: Comparison of Poverty Estimates Based on Uniform Recall Period

	1993-94	2004-05
Rural	37.3	28.3
Urban	32.4	25.7
Total	36.0	27.5

Table-2 Comparison of Poverty Estimates Based on Mixed Recall Period

	1999-2000	2004-05
Rural	27.1	21.8
Urban	23.6	21.7
Total	26.1	21.8

Environment Legislation, Acts, Rules, Notifications and Amendments

In the Constitution of India it is clearly stated that it is the duty of the state to '*protect and improve the environment and to safeguard the forests and wildlife of the country*'. It imposes a duty on every citizen '**to protect and improve the natural environment including forests, lakes rivers and wildlife**'. Reference to the environment has also been made in the Directive Principles of State Policy as well as the Fundamental Rights. The Department of Environment was established in India in 1980 to ensure a healthy environment for the country. This later became the Ministry of Environment and Forests in 1985.

The constitutional provisions are backed by a number of laws – acts, rules and notifications. The Environment Protection Act of 1986(EPA) came into force soon after the Bhopal Gas Tragedy and is considered an umbrella legislation as it fills many gaps in the existing laws. Thereafter a large number of laws came into existence as the problems began arising e.g. Handling and Management of Hazardous Waste Rules in 1989.

Following is a list of the environmental legislations that have come into effect:

- General
- Forest and wildlife
- Water
- Air

General

1986 – The Environment (Protection) Act authorizes the central government to

protect and improve environmental quality, control and reduce pollution from all sources, and prohibit or restrict the setting and /or operation of any industrial facility on environmental grounds.

1986 – The Environment (Protection) Rules lays down procedures for setting standards of emission or discharge of environmental pollutants.

1989 – Hazardous waste (Management and Handling) Rules objective is to control generation, collection, treatment, import, storage and handling of hazardous waste.

1989 – The Manufacture, Storage and Import of Hazardous Chemical Rules defines the terms used in this context, and sets up an Authority to inspect, once a year, the industrial activity connected with hazardous chemicals and isolated storage facilities.

1989 – The Manufacture, Use, Import, Export and Storage of hazardous Micro-organisms/ Genetically Engineered Organisms or Cells Rules were introduced with a view to protect the environment, nature and health, in connection with the application of gene technology and micro organisms.

1991 – The Public Liability Insurance Act and Rules and Amendment, 1992 was drawn up to provide for public liability insurance for the purpose of providing immediate relief to the persons affected by accident while handling any hazardous substance.

1995 – National environmental Tribunal Act has been created to award compensation for damages to persons, property and the environment arising from any activity involving hazardous substances.

1997 – The National Environment Appellate Authority Act has been created to hear appeals with respect to restrictions of areas in which classes of industries etc are carried out or prescribed subject to certain safeguards under the EPA (Environment Protection Act).

1998 – Biomedical waste (Management and Handling) Rules is a legal binding on the health care institutions to streamline the process of proper handling of hospital waste such as segregation, disposal, collection and treatment.

Forest and wildlife

1927 – Indian Forest Act and Amendment 1984 is one of the many surviving colonial statutes. It was enacted to 'consolidate the law related to forest, the transit of forest produce and the duty leviable on timber and other forest produce.

1972 – Wildlife Protection Act, Rules 1973 and Amendment 1991 provides for the protection of birds and animals and for all matters that are connected to it whether it be their habitat or the waterhole or the forest that sustain them.

1980 – The Forest (Conservation) Act and Rules 1981 provides for the protection of and the conservation of the forests.

Water

1882 – The Easement Act allows private rights to use a resource i.e. groundwater, by viewing it as an attachment to the land. It also states that all surface water belongs to the state and is a state property.

1897– Indian Fisheries Act establishes two sets of penal offences whereby the government can sue any person who uses dynamite or other explosive substance in any way (whether coastal or inland) with intent to catch or destroy any fish or poisons fish in order to kill.

1956 – The River Boards Act enables the states to enroll the Central Government in setting up an Advisory River Board to resolve issues in inter state cooperation.

1970 – Merchant Shipping Act aims to deal with waste arising from ships along the coastal areas within a specified radius.

1974 – The Water (Prevention and Control of Pollution) Act establishes an institutional structure for preventing and abating water pollution. It establishes standards for water quality and effluent. Polluting industries must seek permission to discharge waste into effluent bodies. The Pollution Control Board (CPCB) was constituted under this act.

1977 – The Water (Prevention and Control of Pollution) Cess Act provides for the levy and collection of cess or a fees on water consuming industries and local authorities.

1978 – The Water (Prevention and Control of Pollution) Cess Rules contains the standard definitions and indicate the kind of and location of meters

that every consumer of water is required to affix.

1991 – Coastal Regulation Zone Notification puts regulations on various activities, including construction, are regulated. It gives some protection to the backwaters and estuaries.

Air

1948 – Factories Act and Amendment in 1987 was the first to express concern for the working environment of the workers. The amendment of 1987 has sharpened its environmental focus and expanded its application to hazardous processes.

1981 – Air (Prevention and Control of Pollution) Act provides for the control

and abatement of air pollution. It entrusts the power of enforcing this act to the Central Pollution Control Board.

1982 – Air (Prevention and Control of Pollution) Rules defines the procedures of the meetings of the Boards and the powers entrusted on them.

1982 – Atomic Energy Act deals with the radioactive waste.

1987 – Air (Prevention and Control of Pollution) Amendment Act empowers the central and state pollution boards to meet with grave emergencies of air pollution.

1988 – Motor Vehicles Act states that all hazardous waste is to be properly packaged, labeled and transported.

Land–use classification in India

1. **Forest:** Includes all lands classed as forests under any legal enactment dealing with forests or administered as forests.
2. **Area under Non-agricultural Uses:** Includes all lands occupied by buildings, roads and railways or under water, *e.g.* river, and canals and other lands used for non-agriculture purpose.
3. **Barren and un-cultivable land:** Includes all barren and un-cultivable land like mountains, desert etc.
4. **Permanent pastures and other grazing lands:** Includes all grazing lands where they are permanent pastures and meadows or not. Village common grazing land is included under this head.
5. **Land under miscellaneous tree crops and groves etc:** This includes all cultivable land, which is not included in 'Net Area Sown' but is put to some agricultural uses. Lands under Casuarina trees, thatching grasses, bamboo bushes, and other groves for fuel, etc which are not included under 'Orchards' are classified under this category.
6. **Culturable Wasteland:** This includes lands available for cultivation. Such lands may be either fallow or covered with shrubs or jungles, which are not put to any use. Land once cultivated but not cultivated for five years in succession should be include in this category at the end of the five years.
7. **Fallow lands other than current fallows:** This includes all lands, which were taken up for cultivation but are temporarily out of cultivation for a period of not less than one year and not more than five years.
8. **Current Fallows:** This represents cropped area, which are kept fallow during the current year. For example, if any seeding area is not cropped in the same year again, it may be treated as current fallows.
9. **Net Area Sown:** This represents the total area sown with crops and orchards. Area sown more than once in the same year is counted only once.

Agriculture land/Cultivable land/Culturable land = 5+6+7+8+9

Cultivated Land= 8+9

Reporting are of land utilization= 1 to 9