

INTRODUCTION



Chapter 1

Introduction

One of the first conditions of happiness is that the link between man and nature shall not be broken

-Leo Tolstoy

Background

1.1 Since time immemorial living in harmony with nature has been ingrained in the cultural ethos of India. Realizing this, the environmental issues are embedded in India's Constitutional guidelines adopted in 1950. The Directive Principles of State Policy, given in the Constitution of India, contain provisions that reflect the State's commitment to protect the environment, including forests and wildlife, and which enjoin upon the citizens of India the responsibility to protect and improve the environment.

1.2 However, in the current times the harmony between people and nature is getting disrupted at an accelerated pace, essentially due to rapid industrialization and urbanization. These factors degrade and damage the environment causing the horrendous impacts of climate change. The impact of climate change can be easily seen on human health from frequent extreme weather events such as heatwaves, storms and floods, droughts, the disruption of food systems, increased zoonoses and vector-borne diseases and mental health issues. Apart from these, climate change undermines several determinants for good health such as livelihoods, equality and access to health care and social support structure.

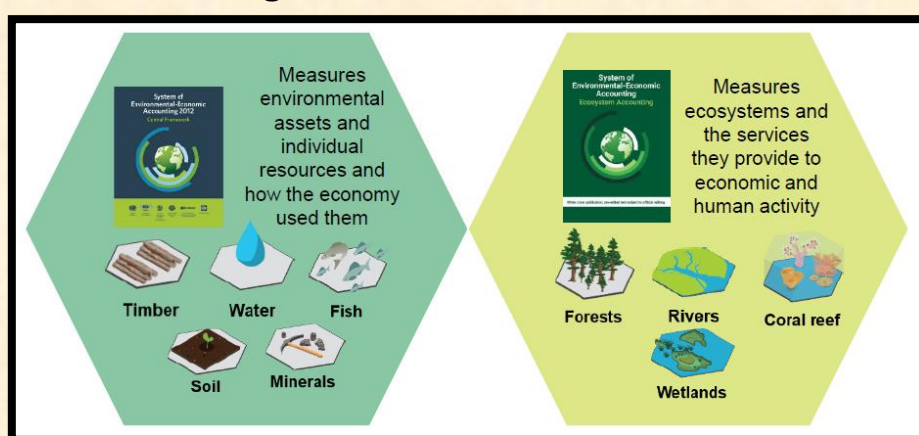
1.3 For a developing country like India with GDP of approximately ₹198 lakh crore for the year 2020-21 at current prices¹, it is important to maintain the economic growth rate, but at the same time due importance also needs to be given towards addressing the concerns of sustainability. The key is to ensure that the growth remains sustainable and the country is able to retain or rather enhance its natural wealth required for economic activity and well-being for future generations as well. Thus, the need of the hour is to move towards integrating the information on economic activities with those on environment and push the bars for adopting the 'go beyond GDP' approach while clinging on to the parameters of sustainability.

¹ National Accounts Statistics 2022, Ministry of Statistics and Programme Implementation

The System of Environmental-Economic Accounting (SEEA²)

1.4 The System of Environmental-Economic Accounting (SEEA) is an international statistical standard that uses a systems approach to bring together economic and environmental information to measure the contribution of the environment to the economy and the impact of the economy on the environment. The SEEA uses a structure and classifications consistent with the System of National Accounts (SNA) to facilitate the development of indicators and analysis of the economy-environment nexus. There are two sides of SEEA - SEEA-Central Framework (SEEA-CF) and the SEEA-Ecosystem Accounting (SEEA-EA) as illustrated in the **Figure-1.1** below.

Figure 1.1: SEEA-CF and SEEA-EA



Source: UN-SIAP

1.5 The SEEA – CF provides a framework for organizing and presenting statistics on the environment and its relationship with the economy. It brings together economic and environmental information in an internationally agreed set of standard concepts, definitions, classifications, accounting rules and tables to produce internationally comparable statistics. The SEEA-CF helps to account for the stocks of the environmental assets and flows between the environment and the economy. Environmental stocks and flows are considered holistically. From a stock perspective, the environment includes all living and non-living components that constitute the biophysical environment, including all types of natural resources and the ecosystems within which they are located. From the perspective of environment flows, the environment is the source of all-natural inputs for the economy, including natural resources inputs (minerals, energy, timber, fish, soil etc.) and other natural inputs absorbed by the economy, for example, energy from solar and wind resources and the air used in the combustion process.

² <https://seea.un.org/>

- 1.6 The SEEA-CF suggests compilation of mainly 3 types of accounts:
- (i) Physical Supply and Use Tables: to record the physical flows
 - (ii) Monetary Supply and Use Table: to record the flows of products in monetary terms
 - (iii) Asset Accounts (physical and monetary): to record the stocks and the changes in the stocks of environmental assets.

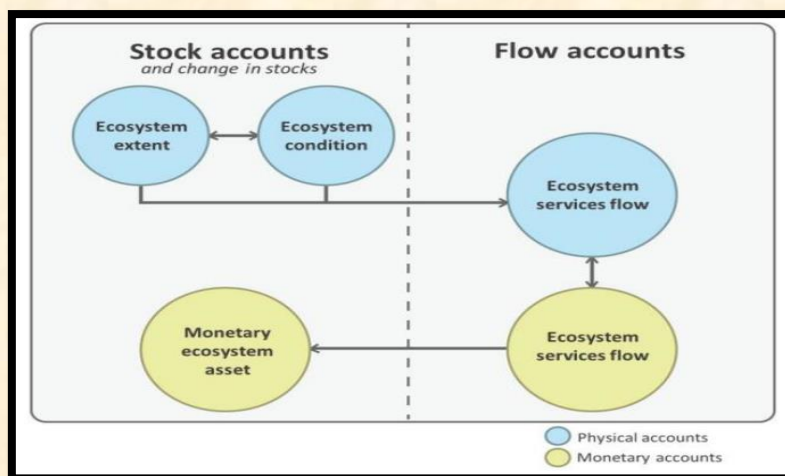
1.7 In the SEEA-CF, the focus is on the individual components of the environment that provide material and space to all economic activities. It, however, does not consider the non-material benefits from the indirect use of environmental assets (e.g. Benefits from ecosystem services such as water purification, storage of carbon and flood mitigation).

1.8 SEEA-Ecosystem Accounting, a complementary framework of SEEA-CF describes the measurement of ecosystems in physical terms and the valuation of ecosystems in so far as it is consistent with the market valuation principles. This also encompasses the environmental assets but focuses on the interactions between individual environmental assets within ecosystems and on the broad set of material and non-material benefits that accrue to the economy and other human activity from flows of ecosystem services. Broadly the following accounts are prescribed in the SEEA-EA:

- (i) Extent Accounts: describes the size of the ecosystem assets (Ecosystem Assets are contiguous spaces of a specific ecosystem type characterized by a distinct set of biotic and abiotic components). For example- forests, wetlands, agricultural areas, marine areas.
- (ii) Condition Accounts: describes the quality of an ecosystem, measured in terms of its biotic and abiotic characteristics.
- (iii) Flows of Ecosystem Service: describes the contribution of the ecosystem to the benefits that are used in the economic and other human activity.
- (iv) Monetary Ecosystem Asset Account: describes the information on stocks and changes in stocks (additions and reductions) of assets and records this information in monetary terms for ecosystem assets based on the monetary valuation of ecosystem services and applying the net present value approach to obtain opening and closing values in monetary terms for ecosystem assets at the beginning and end of each accounting period.
- (v) Thematic Accounts: organizes the data on themes of specific policy relevance. For example - biodiversity, climate change, oceans and urban areas.

1.9 While the extent and the condition accounts describing the spread and the health of the ecosystems are the stock variables, the ecosystem service flows that help to understand the benefits derived from the ecosystems in the economy are the flow variable. A diagrammatic representation (**Figure-1.2**) for the same is presented below for better understanding.

Figure 1.2: Set of Ecosystem Accounts

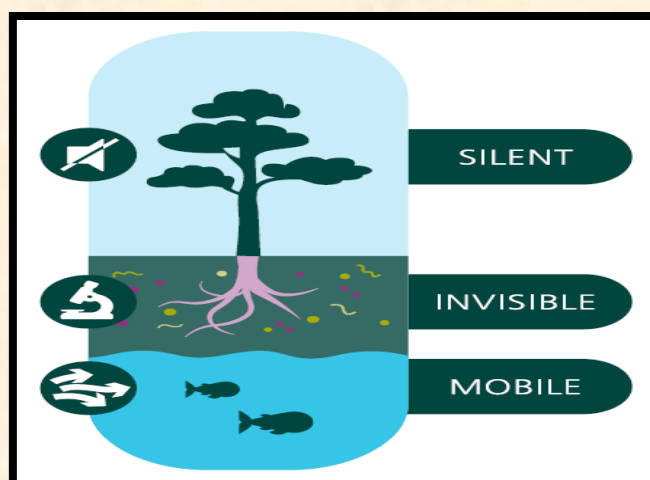


Source: UN-SIAP

1.10 The supply of ecosystem services and the use of these services by economic units, including households, is one of the central features of ecosystem accounting. Ecosystem services are only recorded in case there are actual beneficiaries for the services, i.e. when there is a demand. This is similar to the system of national accounts, which is based on transactions or actual exchanges in the economy.

1.11 It is a well-conceived fact that Nature provides several valuable services to mankind, but despite having immense value in the lives of humans they are often beyond the scope of valuation. The simple reason for this is the lack of available data and market value for nature's services. The three distinctive feature that makes it impossible for markets to record adequately the use human beings make of the Nature's goods and services are- mobility, silence and invisibility. This is shown in the **Figure-1.3** given below:

Figure 1.3: Nature's Property



Source: The Economics of Biodiversity: The Dasgupta Review

1.12 Uncovering the values of ecosystem contributions to people can bridge the gap between growth and well-being. The contribution of the environmental goods and services duly measured enables robust and sustainable decisions and policies.

1.13 The valuation of ecosystem services and ecosystem assets is a complex process, but it is essential to frame, prioritize and justify the sustainable development policies oriented towards the protection or restoration of ecosystem. Ecosystem services accounts are a very useful tool that provides pertinent information on the role of ecosystems in delivering services that in turn benefit the society. Ecosystem services contribute to two types of benefits. In the context of ecosystem accounting, benefits that are produced by ecosystem services may either be System of National Accounts (SNA) benefits, or they may be non-SNA benefits.

- i. The products produced by economic units (e.g., food, water, clothing, shelter, recreation) are referred to as SNA benefits, since the measurement boundary is defined by the production boundary used to measure Gross Domestic Product (GDP) in the System of National Accounts (SNA). This includes goods produced by households for their own consumption.
- ii. The benefits that accrue to individuals that are not produced by economic units (e.g., clean air) are referred to as non-SNA benefits, reflecting the fact that the receipt of these benefits by individuals is not the result of an economic production process defined within the SNA. A distinguishing characteristic between these two types of benefits is that, in general, SNA benefits can be bought and sold on markets whereas non-SNA benefits cannot be.

1.14 Some ecosystem services are already included in GDP (as they contribute to products, for example timber which already fall in the production boundary of the SNA), but others (e.g. carbon retention) fall outside the SNA production boundary.

Environment Accounts in India

1.15 The National Statistical Office (NSO) under the Ministry of Statistics and Programme Implementation (MoSPI) is mandated with “Development of Environment Statistics and Development of methodology, concepts and preparation of National Resource Accounts for India”. With this mandate, the Ministry constituted an Expert Group in 2011 under the chairmanship of Prof. Sir Partha Dasgupta, Frank Ramsey Professor Emeritus of Economics, University of Cambridge, U.K for advising on an implementation plan for compiling “Green National Accounts in India”. The Expert Group submitted its report in 2013 and recommended the compilation of the accounts following the SEEA Framework in a phased manner, i.e. starting with the asset accounts followed by the physical and the monetary flows. Based on the above recommendations, the first

layers of these accounts (i.e., asset accounts) were released in the year 2018, in the publication, EnviStats India 2018 – Supplement on Environment Accounts³, detailing the physical asset accounts of land cover, minerals, water and forests, at the state and national levels.

1.16 Since then, the Ministry has continuously strived to enhance the scope and coverage of environmental accounts, including those of extent and condition accounts. Further, in order to translate the physical values using an economic yardstick, the Ministry evaluated some ecosystem services-such as Crop Provisioning Services, Timber and Non-timber Forest Products Provisioning Services, Carbon Retention Services provided by Forests and Nature-Based Tourism services. These accounts, along with the extent and the condition accounts, present a systematic glimpse of the State of Environment in India in respect of various environmental assets and ecosystems. Several accounts have been released in the form of annual publications “EnviStats India: Vol.II-Environment Accounts” which are presented in the following **Table 1.1**:

Table 1.1: Topics covered in EnviStats India

Type of account	Topics covered (Year of publication given in parentheses)
Ecosystem extent	Change matrix of Land Use – Land Cover (LULC) from 2005-06 to 2011-12 and 2011-12 to 2015-16 (2018, 2020) Asset Account for Land Use-Land Cover (LULC), 2005-06, 2011-12 and 2015-16 (2018, 2020) Accounts related to the Land Degradation, 2005-06 and 2015-16 (2020) Wetland Extent Account- 2006-07 (2020)
Ecosystem condition	Soil nutrient indices (2019, 2021) Water quality accounts (2019, 2021) Forest condition account (2020) Cropland condition account (2020) Wetland Condition account (2020)
Ecosystem services	Crop provisioning services (monetary) (2019, 2021) Timber provisioning services (monetary) (2020) Non-Timber Forest Products (NTFP) provisioning services (monetary) (2020) Carbon retention services provided by forests (physical and monetary) (2020)

³ <https://www.mospi.gov.in/web/mospi/reports-publications/-/reports/view/templateFive/6501?q=RPCAT>

Type of account	Topics covered (Year of publication given in parentheses)
	Nature-based tourism (monetary) (2019) Soil erosion prevention services provided by croplands (physical) (2020)
Thematic Accounts	Biodiversity - The extent of protected areas (2020) State-wise floral and faunal species accounts (2020) Species Richness of IUCN Red List species (2020, 2021)
Individual environmental asset accounts (SEEA CF)	Forests – Growing Stocks of Timber and Carbon (2018, 2020) Water (2018)

1.17 In order to expand the coverage of the Environmental Accounts in India, National Statistical Office of MoSPI released the five-year strategy for compiling Environment Accounts in India: 2022-2026 following the SEEA structure⁴. Some of the potential areas for work identified in line with the national priorities are listed below:

- (a) Energy Accounts
- (b) Material Flow Accounts
- (c) Ocean Accounts
- (d) Thematic accounts for Biodiversity and Urban Area Accounts

1.18 The current publication which is fifth in the series covers Energy Accounts, Solid Waste Accounts, Wetlands including Mangroves and Estuaries, Fish Provisioning Services, Forest Ecosystems Accounts and Species Richness of IUCN Red List Species. A brief description of the remaining chapters is provided in the subsequent paragraphs.

Chapter 2. Energy Accounts

1.19 As far as the energy sector of India is concerned, two recent monumental achievements have paved the way towards the well-being of a huge number of people of India. The first is India's success in bringing electricity connections to hundreds of millions of its citizens and the second is the accelerating rate at which India grasped the transformative potential of renewables and solar in particular. India⁵ is a major force in the global energy economy. While the country's rapid pace of industrialization and urbanization will create huge demands of the energy sector, policy makers ought to target for policies to bring about a secure and sustainable energy future. To aid the policy

⁴ Strategy for Environmental Economic Accounts in India: 2022- 2026
<https://www.mospi.gov.in/documents/213904/301563//Environment%20Accounting%20Strategy%202022-261638528460762.pdf/8da50af2-45ad-9569-d765-fa79b73ec6ae>

⁵ <https://www.iea.org/reports/india-energy-outlook-2021/energy-in-india-today>

makers with the appropriate information about the energy sector, the publication covers the compilation of the Energy Accounts.

1.20 Energy Accounts organizes the Energy related information in an internationally accepted framework. While the Energy Statistics are often developed to address specific policy questions and issues, Energy Accounts merge a wide range of Energy related statistics across sectors into one consistent framework. NSO, India has been regularly compiling Energy Statistics following the International Recommendation for Energy Statistics (IRES) framework. This year the publication covers Energy Accounts following the SEEA-Energy framework utilizing Energy Statistics as the base for the years 2015-16 onwards. Chapter 2 of the publication provides the Physical Asset Accounts for Energy and the Physical Supply and Use Tables utilizing the data provided by M/o Coal, M/o Petroleum & Natural Gas, Geological Survey of India and Central Electricity Authority of Ministry of Power.

Chapter 3: Solid Waste Accounts

1.21 As a subset of the Material Flow Accounts, NSO India has attempted to compile the accounts for the Solid Waste for the Union territory of Delhi. The Solid Waste Accounts provides organized information on the generation of solid waste and the management of flows of solid waste to recycling facilities, to controlled landfills or directly to the environment. The main idea behind the compilation of the solid wastes is to get a glimpse of the collection and management of solid waste in the area. The exercise has been undertaken on an experimental basis which can be expanded subsequently with the availability of information.

1.22 Chapter 3 of the publication provides estimates for the Solid Waste Accounts-Physical Supply and Use Table using the SEEA framework. The accounts contain seven components of solid waste comprising of Municipal Solid Waste, Bio-medical Waste, Hazardous Waste, Plastics, E-waste, Construction & Demolition Waste and Battery Waste. These accounts would provide a basis for identifying the amount of wastes that enter the environment, thus paving a pathway towards achieving a circular economy model wherein the wastes are reduced to minimum.

Chapter 4: Wetlands Accounts

1.23 Wetlands are amongst the most productive ecosystems on the Earth and provide many important services to human society. However, they are also ecologically sensitive and adaptive systems. Wetlands exhibit enormous diversity according to their genesis, geographical location, water regime and chemistry, dominant species, and soil and sediment characteristics. India supports unique geographical diversity and different climatic zones, which in turn supports diverse wetland habitats throughout the

subcontinent and covers nearly 15.98 million hectares⁶. Wetlands are considered to have unique ecological features which provide numerous products and services to humanity. Ecosystem goods provided by the wetlands mainly include: water for irrigation; groundwater recharge; fisheries; non-timber forest products; water supply; and recreation. Besides, more than one billion people depend on wetlands for their wellbeing. Wetland helps sustain the wide variety of life on our planet, protects our coastlines and biodiversity, acts as a natural sponge against river flooding, nutrient removal, toxics retention and stores carbon dioxide to regulate climate change. Furthermore, wetlands have also been providing a variety of ecological, biological and hydrological functions which offers economic, aesthetic, recreational, educational and other values to the society.

1.24 Chapter 4 on the wetlands provides the extent account for the Wetlands in India along with the decadal change matrix for the years 2006-07 and 2017-18. In addition, the chapter highlights the extent of the mangroves and the estuaries and the associated biodiversity in these wetlands.

Chapter 5: Fish Provisioning Services

1.25 SEEA-EA defines ecosystem services as the contribution of the ecosystems to benefits used in the economic and other human activity which is categorized into 3 categories: Provisioning Services, Regulating & Maintenance Service and Cultural Services

1.26 With the use of the information provided by the States on the Rent/Lease of the rivers/ponds where the fishes thrive, estimates of the Fish Provisioning Services have been computed in Chapter 5 of the publication. The information has been compiled for Andhra Pradesh (2015-16 to 2021-22), Rajasthan (2015-16 to 2020-21) and Haryana (2015-16 to 2020-21).

Chapter 6: Forests Accounts

1.27 The rapid deterioration of the environment, which are the underlying causes for the climate change, biodiversity loss and the emergence of new diseases, has raised an alarm globally. Forests and trees have the potential to address these crises and move towards sustainable economies. Forests contain more carbon than half the global carbon stock in soils and vegetation. Apart from providing timber and non-timber forest products, forests ecosystems conserve soils and stabilize flows and runoff which in turn prevents land degradation and desertification, and diminishes the risks of disasters. In

⁶ Space based observation of Indian wetlands, Indian Space Research Organisation, Ahmedabad

essence, forests silently provide a multitude of services to humankind which are much beyond quantification.

1.28 Chapter 6 of the publication presents the Forests Extent and the Condition Accounts based on the data available in the India State of Forest Report published by the Forest Survey of India, Ministry of Environment, Forest and Climate Change (MoEFCC). In addition, the estimates for the Timber and Non-timber provisioning services (2011-12 to 2019-20) and the carbon retention services, a 'regulatory service' have been compiled at both current and constant prices. While the former two services can be linked to economic activity or SNA benefits, the 'carbon retention services' help understand the contribution of the forests in climate regulation and hence global wellbeing. In order to make the estimates comparable with the National Accounts, the base year has been chosen as 2011-12.

Chapter 7: Biodiversity

1.29 In recent decades humanity has been degrading our most precious asset, the natural environment, at rates far greater than ever before. As a result, the material standard of living of the average person in the world has gone up. But, in the process of achieving high 'growth numbers' humankind has degraded the biosphere to the point where the demands made of its goods and services far exceed its ability to meet them on a sustainable basis.

1.30 The Dasgupta report titled 'The Economics of Biodiversity'⁷ stressed on the fact that biodiversity is the key to the processes governing ecosystems. The decline of biodiversity disrupts biospheric processes, for example the processes governing the climate system. The sustainability of the humans' engagement with nature is thus ultimately about the functioning of the biosphere which includes both the living and the non-living part of it.

1.31 Chapter 7 of the publication presents the taxonomic faunal and floral diversity of India, the status and conservation efforts in respect of Leopard, and Species Richness of Red List species, by taxonomic groups, as compiled using Spatial Datasets sourced from the International Union for Conservation of Nature (IUCN). The IUCN Spatial Dataset is generally updated thrice a year. The publication, EnviStats India 2020, Vol. II Environment Accounts included the analysis of the IUCN Spatial Datasets of Red List species for three categories – Mammals, Amphibians and Reptiles using the 2020 Version 2. Subsequently, in 2021 the analysis of the Spatial Dataset for the two subsequent versions - 2020 Version 3 and 2021 Version 1 – and for three more categories – Plants, Mangroves and Freshwater group (consisting of both flora and fauna present in

⁷https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/962785/The_Economics_of_Biodiversity_The_Dasgupta_Review_Full_Report.pdf

freshwater) were included. The current publication presents the results of state-wise assessment of IUCN Red List species using the spatial datasets of 2021 Version 2, 2021 Version 3 and 2022 Version 1.

Conclusion

1.32 NSO, India has been constantly striving to improve the coverage of environmental accounts in terms of time, domains and geographic coverage. However, it is expected that for a megadiverse country like India, the understanding of the data sources and methods used to compile accounts will evolve over time as a result of engagement with the data sources agencies and the users, especially the policy makers. Consequently, as with all statistical products, with the availability of updated data, the accounts presented so far do have a scope of further revision and refinement to depict better connection between environment and economic and human activity.

1.33 EnviStats India envisages to provide a panoramic view of the complex interactions involving the ecosystems of the country and intends to provide the right thrust towards the direction of mainstreaming environmental information into government decision making for a 'Better Environment, Better Tomorrow'.
