



Introduction

Understanding ecosystems through EnviStats India

“Economic growth which strips out the planet's ecosystems is not sustainable”

Introduction

1. Life on this planet depends upon a large number of goods and services provided by nature. Ecosystems are natural capital assets supporting services which are highly valuable and necessary for human livelihoods. Ecosystems act as resource producers and processors. Apart from intrinsic value they have, ecosystems also contribute significantly to economic activities and in that sense provide economic value.

2. Natural capital accounting (NCA) is an umbrella term covering efforts to make use of an accounting framework to provide a systematic way to measure and report on stocks and flows of natural capital. NCA covers accounting for individual environmental assets or resources, both biotic and abiotic (such as water, minerals, energy, timber, fish), as well as accounting for ecosystem assets (e.g. forests; wetlands), biodiversity and ecosystem services, in both physical and monetary terms. Just like the compilation of national accounts of a country is guided by the System of National Accounts (SNA), for natural capital accounting, the System of Environmental-Economic Accounting (SEEA) is taken as a starting point¹.

Ecosystem Accounts in the System of Environmental-Economic Accounting framework

3. The System of Environmental-Economic Accounting (SEEA) provides a framework for measuring the link between the environment and the economy. The SEEA uses concepts, definitions, and classifications consistent with the System of National Accounts (SNA) to facilitate the integration of environmental and economic statistics, enabling the development of indicators to inform on economy-environment nexus. SEEA-Central Framework was adopted in February 2012 as an international statistical standard by the UN Statistical Commission.

4. The SEEA provides the internationally moderated framework for remedying the ‘information silo’ approach to statistics and for providing information that directly responds to the demand of integrated policy-making. The SEEA utilizes the principles of economic accounting, building on the existing System of National Accounts (SNA).

¹ <https://seea.un.org/>

The SEEA accounts bring into direct focus the relationship between the environment and economy not revealed through traditional measures of economic activity, such as Gross Domestic Product (GDP) and national income. Some of its major strengths are in its approach to integrating statistics to allow for multiple purposes and multiple scales of analysis. Several key aggregates can be directly derived from the accounting tables, that can be of interest to policy analysis and goal-setting.

5. Supplementing the Central Framework, in March 2013, in order to provide the necessary guidance on a range of issues related to ecosystems, the United Nations Statistical Commission (UNSC) endorsed SEEA- Experimental Ecosystem Accounting (*SEEA EEA*) as the basis for ecosystem accounting². The SEEA EEA was formally published in 2014 as a joint publication of the United Nations, European Commission, Food and Agriculture Organization of the United Nations (FAO), Organisation for Economic Co-operation and Development (OECD) and the World Bank (WB).

6. Given the level of interest, testing and experimentation, the UN Committee of Experts on Environmental-Economic Accounting (UNCREEA) determined in June 2017 that a revision of the SEEA EEA was required to reach agreement on the different aspects of ecosystem accounting. This revision process has now commenced and is based on the SEEA EEA endorsed in 2013, the experiences of the many initiatives on ecosystem accounting in practice, and on the Technical Recommendations in support of the SEEA EEA 2012³.

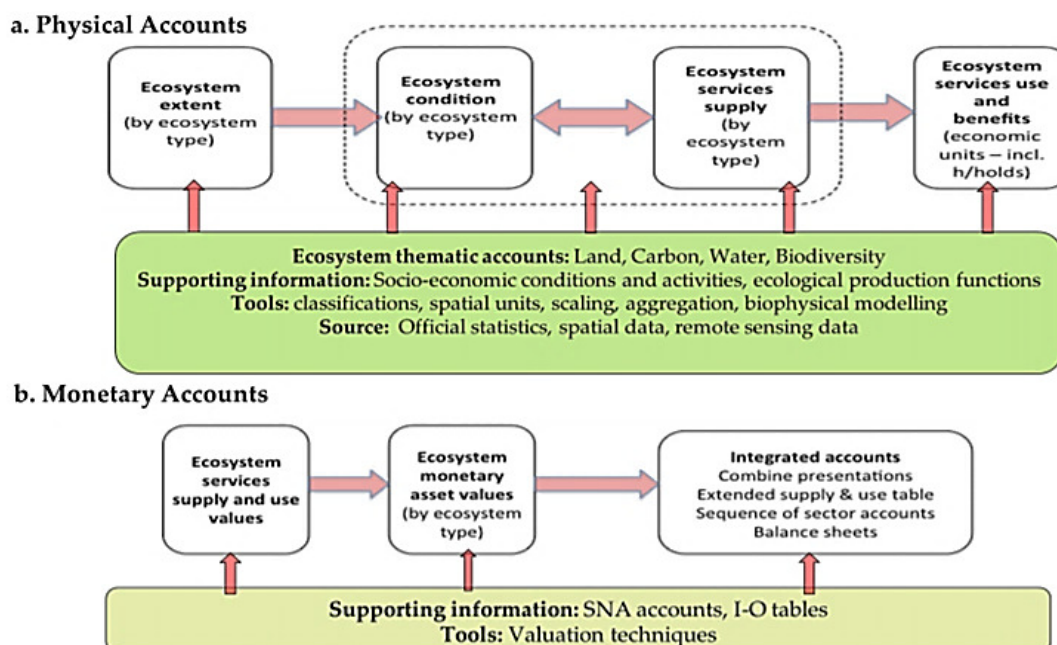
7. The SEEA EEA Revision was officially launched in March 2018 at the 49th session of the UNSC. A set of 26 discussion and background papers were drafted that involved over a 100 experts, which now serve as the bases for drafting of the chapters of the revised SEEA EEA. The first global consultation on the individual chapters of the revised SEEA EEA has been completed in August 2020. The final revised SEEA EEA is expected to be discussed for adoption by the United Nations Statistical Commission at its session in March 2021.

8. The SEEA EEA provides a common framework for integrating information on ecosystems (i.e. ecosystem extent, ecosystem condition, ecosystem services) as well as existing accounting information on economic and other human activity dependent on ecosystems and associated beneficiaries (households, businesses and governments). The broad steps in ecosystem accounting are shown in Figure 1 below.

²[United Nations, European Commission, Food and Agricultural Organization of the United Nations, Organisation for Economic Co-operation and Development, The World Bank \(2014\) System of Environmental-Economic Accounting 2012 - Experimental Ecosystem Accounting. United Nations, New York](#)

³[Technical Recommendations in support of the System of Environmental Economic Accounting, 2012;](#) (white cover publication).

Figure 1: Broad steps in Ecosystem Accounting



Source: Technical recommendations in support of the SEEA EEA 2012

9. Understanding *ecosystem extent* is generally the starting point of ecosystem accounting. Ecosystem extent accounting provides the basis, the composition of and the changes in, ecosystem types within the country and providing the time variant changes in the extent helps reveal the degree of change in the ecosystems. Apart from these, it provides an underlying structure for the measurement of ecosystem condition and modelling of many ecosystem services, which is the essence for formulation of environmental policies and decision making.

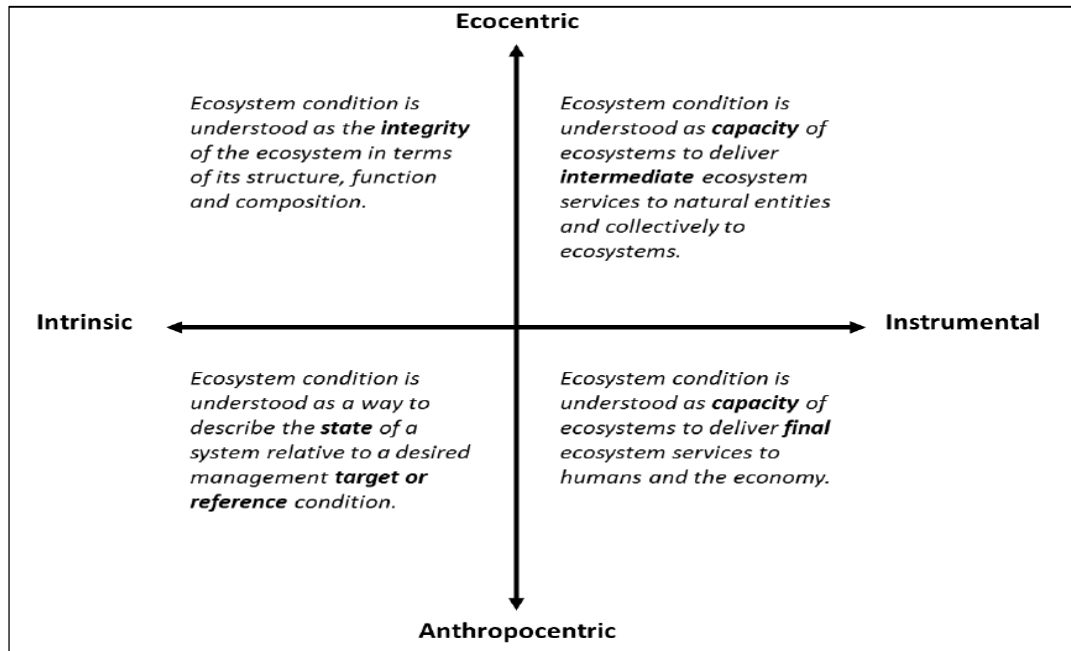
10. *Ecosystem assets* are contiguous spaces of a specific ecosystem type characterized by a distinct set of biotic and abiotic components. *Ecosystem condition* is defined as the overall quality of an ecosystem asset in terms of its characteristics². It establishes the link between changes in ecosystem assets over time with the benefits derived from the stocks⁴.

11. The purpose of ecosystem condition accounts can be defined in terms of a two-dimensional values framework that incorporates intrinsic and instrumental values, and anthropogenic and ecocentric (centring on environmental conservation)

⁴ Keith, H. M. (Version of 13 March, 2019). Discussion paper 2.1: Purpose and role of ecosystem condition accounts. Paper submitted to the SEEA EEA Technical Committee as input to the revision of the technical recommendations in support of the System on Environmental-Economic Accounting, 1-34.

approaches (Figure 2). Depending on the approach selected by the compilers, condition accounts can be compiled with reference to an initial, natural or undisturbed state from the past or with a target states or using comparisons across different locations.

Figure 2: A general values framework representing the range from intrinsic to instrumental values and from ecocentric to anthropogenic world views (adapted from Turner, 2001⁵)



12. Ecosystem condition along with extent gives an overall measure about the state of ecosystem asset. They describe the characteristics of each *ecosystem asset* using a variety of measured variables and derived indicators. This composite set of indicators is referred to as SEEA Ecosystem Condition Typology (SECT). Table 1 below gives a brief description of the SECT.

Table 1: SEEA Ecosystem Condition Typology (SECT)

SECT Superclass	SECT class
Abiotic ecosystem characteristics	1. Physical state characteristics (including soil structure, water availability)
	2. Chemical state characteristics (including soil nutrient levels, water quality, air pollutant concentrations)

⁵ Turner RK 2001. The place of economic values in environmental valuation. In: Valuing environmental preferences: theory and practice of the contingent valuation method in the US, EU, and developing countries. Eds IJ Bateman and KG Willis. Oxford Scholarship Online doi:10.1093/0199248915.003.0002.

SECT Superclass	SECT class
Biotic ecosystem characteristics	3. Compositional state characteristics (including species-based indicators)
	4. Structural state characteristics (including vegetation, biomass, food chains)
	5. Functional state characteristics (including ecosystem processes, disturbance regimes)
Landscape level characteristics	6. Landscape and seascape characteristics (including landscape diversity, connectivity, fragmentation)

13. They are combined by ecosystem type within the accounting area as every ecosystem type has different characteristics. Characteristics relate to the operation of the ecosystem and its location and thus each ecosystem would require to be assessed with reference to a different set of representative variables and indicators that may be physical, chemical or biological.

14. A three-stage approach has been suggested in the SEEA for the compilation of ecosystem condition accounts. It is described briefly as follows:

- In stage 1, key characteristics are selected and data on relevant variables are collated;
- In stage 2, a general reference condition is determined and for each variable a corresponding reference level is established that allows a condition indicator to be derived; and
- In stage 3, condition indicators are normalized to support aggregation and the derivation of ecosystem condition indexes.

The three stages stated above are expected to allow integration of the different indicators and the movement from one stage to another would require a progressive building of dataset. Nevertheless, data from each stage will be of relevance to policy and decision making.

15. The flow of goods and services which occur naturally by ecological interactions between biotic and abiotic components in an ecosystem is often referred as ecosystem services. Ecosystem services are often taken for granted, but they provide much of the necessary foundation for the economy and society. These goods and services not only provide tangible and intangible benefits to human community but are also critical to the functioning of ecosystem. Both renewable and non-renewable natural resources and ecosystem services are a part of the real wealth of nations. They are the natural capital that underpins other forms of capital.

16. In SEEA Experimental Ecosystem Accounting, *ecosystem services are defined as the contributions of ecosystems to benefits used in economic and other human activity*. The three main ecosystem service categories are:

- Provisioning services are those ecosystem services representing the material contributions supplied by an ecosystem.
- Regulating and maintenance services are those ecosystem services resulting from the capacity of ecosystems to regulate and maintain climate, hydrological and biochemical cycles, Earth surface processes and a variety of biological and geological processes.
- Cultural services are the perceived or realized qualities of ecosystems whose existence and functioning enables a range of cultural benefits to be derived by individuals.

17. 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.

18. The valuation of ecosystem services and ecosystem assets is a complex undertaking, but it is essential to frame, prioritise 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 which, in turn, benefits the society.

19. Valuation of ecosystem services is an important aspect of managing the environment as an asset with benefits for everyone. Ecosystem services contribute to two types of benefits. In the context of ecosystem accounting, benefits that are produced by ecosystem services may either be SNA benefit, or they may be non-SNA benefits.

- 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 GDP in the System of National Accounts (SNA).
- 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.

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

Role of NSO India

21. With a view to make the environmental accounts fit for policy, NSO India ensures adherence to the following principles:

- i. Acknowledge and link the diverse stakeholders concerned - the producers and the policy makers, using the environmental accounts, and setting in place a mechanism for working together;
- ii. Adopt a comprehensive, multi/interdisciplinary approach to understand the linkages between the economic and environmental dimensions so that these could be appropriately factored into policy;
- iii. Assess, compile and streamline data from all available sources, while deploying objective and consistent methods;
- iv. Establish the methods and the systems that can provide relevant and timely information, at an appropriate scale and/or levels, for addressing the needs of decision makers;
- v. Enable and encourage public access and use of environment accounts and ensure clear communication of the results and their interpretation;
- vi. Ensure availability of latest information, by defining periodicity of releases and building increasingly rich time series of data; and
- vii. Set up processes for continuous improvement by networking across practitioners and users, through quality assessments and by testing new approaches.

22. With a view to fulfil the mandate as stated above, NSO India has constituted an Inter-Ministerial Group (IMG) on Environmental-Economic Accounting-India, comprising the Ministries dealing with the natural resources like Ministry of Environment, Forests and Climate Change (MoEFCC), Ministry of Jal Shakti and Ministry of Earth Sciences; the National Remote Sensing Centre and the Comptroller and Auditor General (C&AG) of India. The IMG meets twice a year and is envisaged to provide methodological guidance and support for the compilation of Environmental Economic Accounts.

23. NSO India is also coordinating the EU-funded project on “Natural Capital Accounting and Valuation of Ecosystem Services”⁶, for understanding the linkages between SEEA and policy so that these accounts can be mainstreamed to enable data-driven decision and policy making at national, regional and local levels.

⁶ <https://seea.un.org/home/Natural-Capital-Accounting-Project>

EnviStats India and Ecosystem Accounts

24. NSO India with the support of the IMG and the technical guidance provided under the EU-funded project, in 2018, released “*EnviStats India 2018 – A Supplement on Environment Accounts*”. This publication was the first in the series of annual publications of NSO India to ensure that accounts depicting the status of environment are made available in the public domain, to facilitate an understanding of the interdependence between the “factor nature” and the economy. In this publication, the asset accounts in physical terms of four natural resources – forest, land, minerals and water were presented. A brief description of the asset accounts is given in the following paragraphs:

Land: The chapter contained the national and state-wise land cover accounts in physical terms and the associated change matrices that have been compiled using the National Remote Sensing Centre’s Land Use Land Cover data for the years 2005-06 and 2011-12.

Forest: The chapter contained the asset account of forests and other wooded land compiled using the biennial publication of the Forest Survey of India, “India State of Forest Report”. In addition, the chapter also contains national and state-wise estimates of growing stock and carbon stock in the forests of India.

Minerals: The chapter included state-wise and mineral-wise reserves / resources for the years 2005, 2010 and 2015, mainly sourced from the National Mineral Inventory conducted by the Indian Bureau of Mines. The information in respect of coal, lignite, petroleum and natural gas was obtained from the concerned Ministries.

Water: In addition to the information on the status of water resources of the country compiled from the various publications of the Central Water Commission, the chapter also provides detailed information on groundwater, which is important in view of the predominant dependence on groundwater for irrigation and domestic use.

25. In the subsequent publication released in 2019, some layers on the quality characteristics were added, namely, soil nutrient index and water quality accounts in respect of surface, ground and sea water. In addition, to help understand the contribution of ecosystem services to the economy, values of two ecosystem services have been compiled for all the States of the country – cropland ecosystem services (provisioning of crops) and nature-based tourism.

26. Recognizing the fact that the relationship between the environment and economy is multi-layered, this year’s publication includes not just updates of some of the previously published accounts, like those of Land Cover, but also includes some

fresh ecosystem extent and condition accounts and estimates of ecosystem services. A brief overview of the contents is given in the following paragraphs.

Chapter 1 - Land - A Finite Resource

27. The finiteness of land is a concern for India, even though the country has a land area of about 328 million hectares which is the seventh largest land area among the countries of the world. The population density has tripled in the past 50 years bringing to fore the urgent need for efficient land management. Recognizing the fact that understanding of the status of land and the changes in its utilisation can be aided by SEEA-based land accounts, this chapter gives the Land Cover Accounts, giving asset accounts for the years 2005-06, 2011-12 and 2015-16. In addition, to enable a better comprehension of the status of land in India, information has also been provided on degraded land and wastelands separately. At a macro level, the changes in land can help understand both the cause and response of regional environment change. The information at local levels can serve as reference and vital inputs for scenario analysis for the decision making of the local land use planning, urbanization management, and land use management.

Chapter 2 - Croplands - Beyond Bread and Butter

28. Agriculture, with its allied sectors, is the largest source of livelihoods in India. 70 percent of its rural households still depend primarily on agriculture for their livelihood, with 82 percent of farmers being small and marginal. With such huge dependency on the agriculture sector, it is necessary for India to not only conserve and protect the croplands in the country and but also to use it sustainably.

29. To provide a bird's eye view of the croplands in India, this chapter gives State-wise extent and condition accounts of croplands in India. Under the condition accounts, two new indices - one of crop diversity and another on cropland fragmentation - have been presented as condition indicators. In order to depict the status of crop diversity across the States of India, 'effective number of crop species' has been compiled using the 'Land Use Statistics' released by the Ministry of Agriculture & Farmers Welfare. Gini index of land concentration has been compiled using the data available under the 'Agriculture Census' to understand the status of fragmentation. A very important ecosystem service provided by the croplands is the 'prevention of soil erosion'. Using soil erosion models, the estimates of 'soil regulation services' provided by croplands have been compiled as the difference between the current estimates of loss of soil and the probable loss of soil due to erosion in case the croplands.

Chapter 3 - Forests - the Climate Protectors

30. Forests are the silent backbone of the human existence. Be it the tree wealth which is an important source of timber and other forest products for economic activity, or its capability to combat and adapt to climate change, forests give the society much more than they take. In this chapter, extent and condition account of forests have been given, along with flows of three forest ecosystem services, viz., Timber Provisioning Services, Non-Timber Forest Products (NTFP) Provisioning Services and Carbon Retention Services. While the former two services can be linked to economic or SNA benefits, the 'carbon retention services' helps understand the contribution of the forests in climate regulation and hence, the global well-being.

Chapter 4 - Wetland - Protecting Water and Life

31. India has a wealth of wetland ecosystems that are distributed in different geographical regions. These wetlands support diverse and unique habitats and as they support a variety of plant and animal life, they provide numerous ecological goods and services. In this chapter, extent accounts of wetlands have been discussed using the indicators sourced from the National Wetland Atlas. Condition accounts have also been compiled for a sample of 111 wetlands across the country using the data made available through the first cycle of 'Wetland Health Cards Scheme' implemented by the Ministry of Environment, Forests & Climate Change. With the UN having declared the next decade, 2021-2030, as the decade of 'Ecosystem Restoration', monitoring the changes in the wetland ecosystem in a structured manner, will be a pre-requisite for framing the initiatives.

Chapter 5 - Biodiversity - the Panacea for Adversities

32. India is recognized as one of the mega-diverse countries of the world. In this chapter, the taxonomic faunal and floral diversity across the some of the States of India have been discussed. To give an overview of the conservation measures being made in the country, the status of Protected areas notified under the Wild Life (Protection) Act, 1972 as also the status and conservation efforts in respect of Key Species - namely Elephant and Tiger have also been discussed in the chapter. The chapter also consists of statistics on Species Richness of Red List species, by taxonomic groups, as compiled using Spatial Datasets sourced from the International Union for Conservation of Nature (IUCN). It is envisaged that the assessment could lead to framing indicators that can be useful for the post-2020 biodiversity monitoring framework.

Chapter 6 - SEEA - Monitoring for Sustainability

33. This chapter discusses the use of SEEA for reporting on the progress made under the various target of the SDGs and the other multilateral environmental agreements and for bringing coherence among the various reporting requirements. Using the example of SDG 11.3.1, it is demonstrated that from the extent of urban

ecosystems, the indicator SDG 11.3.1 can be calculated, by overlaying the information on population over the built-up area of urban ecosystems. Experimental estimates of SDG 11.3.1 for the million plus cities of India have been presented in this chapter.

34. EnviStats India envisages to provide a panoramic view of the complex interactions involving the ecosystems of the country and will continue to strive for expanding the coverage of the information, so as to guide the country for a “better environment, better tomorrow”.
