सत्यमेव जयते

DATA FOR DEVELOPMENT

EnviStats-India

Frequently Asked Questions

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FREQUENTLY ASKED QUESTIONS 2026

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Revision Summary of this Document

Version Number	Date of Issue	Brief Description of Change
Ver1.0	April 22, 2022	First Version
Ver1.1	January 26, 2023	Questions related to the new set of accounts i.e. Energy Accounts, Solid Waste Accounts published in EnviStats India Vol. II 2022 included in the document.
Ver1.2	January 26, 2024	Questions related to the new set of accounts i.e. Material Flow Accounts published in EnviStats India Vol. II 2023 included in the document.
Ver1.3	January 26, 2025	Questions related to the new set of accounts i.e. Ocean Ecosystem Accounts published in EnviStats India: Environment Accounts 2024 included in the document.
Ver1.4	2026	Questions related to new set of accounts i.e. Forest and Pollination services published in Environmental Accounting on Forest 2025 & Explainer Series : Pollination Services 2026 included in the document. In addition, relevant questions from EnviStats India: Environment Accounts 2025, have also been incorporated.

Contents

Frequently Asked Questions

SEEA Framework- Background

1. What is Natural Capital?

The term natural capital is attributed to economist E.F. Schumacher, who presented the concept in his 1973 book *Small is Beautiful.*

Natural Capital[1] is natural asset in its role of providing natural resource inputs and environmental services for economic production. Natural Capital is generally considered to comprise three principal categories: natural resource stocks, land and ecosystems. All of these are considered essential to the long-term sustainability of development for their provision of "functions" to the economy, as well as to mankind outside the economy and other living beings.

Natural Capital[2] is another term for the stock of renewable and non-renewable resources (e.g. plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people.

The concept of natural capital extends beyond nature as a source of raw materials for production (e.g. timber) to include the role of the environment and ecosystems in supporting human well-being through the supply of such important goods and services as clean water, fertile soils and valuable genetic resources.

Natural capital[3] includes all the resources that we easily recognize and measure, like minerals, energy, timber, agricultural land, fisheries and water. It also includes the ecosystem services that are often "invisible" to most people, such as air and water filtration, flood protection, carbon storage, pollination of crops, and habitats for wildlife. These values are not readily captured in markets, so we don't really know how much they contribute to the economy. We often take these services for granted and don't know what it would cost if we lose them.

Since the early 1970s, interest in the practical applications of a natural capital perspective has grown considerably within government, business, civil society and academic communities.

2. What is Natural Capital Accounting?

[1] https://stats.oecd.org/glossary/detail.asp?ID=1730
[2] https://seea.un.org/content/natural-capital-and-ecosystem-services-faq#What%20is%20natural%20capital?
[3] https://www.wavespartnership.org/en/frequently-asked-questions-natural-capital-accounting-nca

Natural Capital Accounting (NCA) [4] 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. Its underlying premise is that since the environment is important to society and the economy, it should be recognized as an asset that must be maintained and managed, and its contributions (services) be better integrated into commonly used frameworks like the System of National Account (SNA).

Natural Capital Accounts[5] are sets of unbiased data for material natural resources, such as forests, energy and water.

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.

3. How are Natural Capital Accounts different from the National Accounts that countries have now?

Natural Capital Accounts are sets of unbiased data for material natural resources, such as forests, energy and water. NCAs follow an international standard approved by the United Nations Statistical Commission (UNSC) called the System of Environmental Economic Accounting (SEEA), while National Accounts follow the framework of the System of National Account (SNA).

The datasets in the National Accounts describe a country's economic performance and forms a basis for calculating Gross Domestic Product (GDP) and other well-known economic indicators, such as the balance of trade and household consumption. While national accounts are limited to the production boundary of the economy, natural capital accounts go beyond that, to account for natural goods and services that aren't subject to market transactions and do not necessarily have a well-established market price.

4. Why do we need to account for Natural Capital?

Natural Capital Accounting 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.

[4] https://seea.un.org/content/frequently-asked-questions#What%20is%20natural%20capital%20accounting?

[5] https://www.wavespartnership.org/en/frequently-asked-questions-natural-capital-accounting-nca

While National Accounts are limited to the production boundary of the economy, natural capital accounts go beyond that, to account for natural goods and services that aren't subject to market transactions and do not necessarily have a well-established market price.

It is therefore important to move beyond traditional GDP. Incorporating natural capital into national accounts will reveal the interactions of economic activity with the environment, and support better economic decisions.

5. Why do we need to measure the Environment?

There is a need for consistent and long-term collection of environmental data. Environmental information is critical for decision-making in both public and private spheres. Without measurement of environmental conditions, little would be known about the dynamism of our natural world.

Data producers have a role to play in helping decision-makers understand the systems which they manage. Without a clear understanding of environmental measurements, and related environmental indicators, the depiction of the state of the environment is unclear.

6. What are Environmental Economic Accounts?

Environmental-Economic Accounts[6] are integrated statistics that illuminate the relationship between the environment and the economy, both the impacts of the economy on the environment and the contribution of the environment to the economy. Environmental Economic Accounts can provide information about the extraction of natural resources, their use within the economy, natural resource stock levels, the changes in those stocks during a specific period and economic activity related to the environment. Environmental Economic Accounts present this information in physical and monetary terms, as appropriate.

7. What is the System of Environmental-Economic Accounting (SEEA)?

The System Environmental Economic Accounting (SEEA) [7] is the accepted international standard for environmental-economic accounting, providing 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.

[6] https://seea.un.org/content/frequently-asked-questions#What%20is%20natural%20capital%20accounting?

[7] https://seea.un.org/ecosystem-accounting

SEEA is produced and released under the auspices of the United Nations (UN), the European Commission, the Food and Agriculture Organization of the United Nations, the Organisation for Economic Co-operation and Development, the International Monetary Fund and the World Bank Group.

It consists of two parts:

(i) The *SEEA-Central Framework (SEEA CF)* was adopted by the UN Statistical Commission as the first international standard for environmental-economic accounting in 2012. The Central Framework looks at "environmental assets", such as water resources, energy resources, forests, fisheries, etc., their use in the economy and the residuals that returns back to the environment in the form of waste, air and water emissions. The CF covers measurement in three main areas: (a) Environmental flows (b) Stock of Environmental Assets (c) Economic activity related to the environment. In addition, there are also several methodological documents that have a sectoral approach such as SEEA-Energy; SEEA-Water and the SEEA Agriculture, Forests and Fisheries (AFF).

(ii) The *SEEA-Ecosystem Accounting (SEEA EA)* complements the Central Framework and represents international efforts toward coherent ecosystem accounting. It takes the perspective of ecosystems and considers how individual environmental assets interact as part of natural processes within a given spatial area. It constitutes an integrated and comprehensive statistical framework for organizing data about habitats and landscapes, measuring the ecosystem services, tracking changes in the ecosystem assets and linking this information to economic and other human activity. Ecosystem accounts enable the presentation of indicators of the level and value of "ecosystem services" in a given spatial area. The UN Statistical Commission adopted the SEEA Ecosystem Accounting at its 52nd session in March, 2021.

In addition, the SEEA Applications and Extensions illustrates to compilers and users of SEEA Central Framework based accounts how the information can be used in analysis and to derive indicators. It is a companion document[8] to the SEEA-CF. This was formulated to help the compilers and users of SEEA accounts understand how the accounts can be used in decision making, policy review and formulation, analysis and research. In particular, SEEA Applications and Extensions is on describing measurement and analysis at a broad national level on topics such as resource use, environmental intensity, environmental protection activity, production of environmental goods and services and environmental assets.

8. What are Ecosystem Assets?

Ecosystem assets are contiguous spaces of a specific ecosystem type characterized by a distinct set of biotic and abiotic components and their interactions. The definition of ecosystem assets is a statistical representation of the general

[8] https://seea.un.org/applications-extensions

definition of ecosystems from the Convention on Biological Diversity. Examples of ecosystem assets include forests, wetlands, agricultural areas, rivers and coral reefs.

Ecosystem assets are the building blocks for the accounting framework and provide the structure for the organization of data about ecosystems. Ecosystem assets supply ecosystem services, either from a single ecosystem asset or by multiple ecosystem assets operating collectively. In this framing, ecosystem assets may be characterized as producing units. Ecosystem assets are measured by their extent and condition as well the basket of ecosystem services flows that they generate. Ecosystem assets are nested within the broader concept of environmental assets as defined within the SEEA Central Framework.

Ecosystem assets are classified into ecosystem types, where the IUCN Global Ecosystem Typology is used as reference classification.

9. What are Environmental Assets?

Environmental assets[9] refer to the stock of renewable and non-renewable natural resources that directly or indirectly generate benefits to people and support economic activity, ecosystem functioning, and human well-being. They comprise the naturally occurring living and non-living components of the Earth, forming the biophysical environment that underpins production systems, ecological processes, and societal welfare.

Under the SEEA Central Framework, environmental assets are treated as part of natural capital and include individual natural resource components such as mineral and energy resources, land, soil resources, timber resources, aquatic resources, other biological resources, and water resources. These assets provide the foundation for measuring physical stocks and flows, resource availability and use, depletion, and environmental sustainability, enabling integration of environmental information with economic statistics.

As per the SNA 2025, environmental assets [10] are recognised as natural resource assets within the non-financial asset boundary of the economy and are classified as non-produced non-financial assets. They comprise mineral and energy resources, land, soil resources, timber resources, aquatic resources, other biological resources, water resources, and explicitly recognised renewable energy resources. The SNA 2025 recognises these assets where ownership or effective control exists and future economic benefits are expected, introduces improved guidance on biological and mineral resources, adopts a split-asset approach where ownership and extraction benefits differ, treats resource depletion as a cost of production alongside depreciation, and strengthens alignment with the SEEA to support sustainability-focused economic analysis

10. What are some of the applications of the SEEA?

[9] https://seea.un.org/sites/seea.un.org/files/session_2_-introduction_to_asset_accounts_in_physical_terms.pdf
[10] https://unstats.un.org/unsd/nationalaccount/sna2025.asp

Examples of the kinds of questions that the SEEA can help answer include:

(i) Who is benefitted and who is negatively impacted by natural resource use? What are the impacts on the state of the environment and on specific sectors of the economy?
(ii) How does depletion of natural resources affect measures of the real income of a nation? What extracting industries and owners of natural resources are responsible for depletion?
(iii) To what extent is decoupling between resource use and economic growth taking place? Which sectors have the highest water productivity or are most energy-intensive?
(iv) How is the wealth of nations, specifically its natural capital, developing over time?
(v) Are the expenditures on environmental protection effective?
(vi) To what extent is the tax system greening? What economic instruments are in place? What is the impact of new instruments?
(vii) What is the size of environmental investment in the economy? How many green jobs is the economy generating?
(viii) What is the carbon footprint or water footprint of the nation?
(ix) Which ecosystem services are being generated, who is benefiting from them, and where are they located?
(x) Are current trends in production and consumption of resources sustainable? Is the amount of waste generated increasing or not? How much of this is being recycled in different economic sectors?

The SEEA Applications and Extensions illustrate to compilers and users of SEEA CF based on the accounts how the information can be used in analysis and the derivation of indicators.

11. How does SEEA relate to SNA?

The System of National Accounts (SNA) is a measurement framework that has been evolving since the 1950s to embody the pre-eminent approach to the measurement of economic activity, economic wealth and the general structure of the economy. The SEEA Central Framework applies the accounting concepts, structures, rules and principles of the SNA to environmental information. Consequently, the SEEA Central Framework allows for the integration of environmental information (often measured in physical terms) with economic information (often measured in monetary terms) in a single framework. Because it uses the same accounting conventions, the SEEA Central Framework is aligned, in general, with the SNA. For example, SEEA accounts use the "residence principle" in determining boundaries, so that data is based on the residence of producer units rather than the territory in which activity occurs, the same approach used for Gross Domestic Product.

12. What are the key SNA 2025 updates aligned with SEEA?

The System of National Accounts(SNA) 2025[11] is the latest internationally agreed standard for compiling national accounts and macroeconomic statistics. It provides a consistent framework to measure production, income, consumption, accumulation and wealth.

SNA 2025 updates earlier versions by addressing financial developments, globalization , digitalization , well-being and sustainability. It strengthens the focus on balance sheets and wealth, including natural resources and non-produced assets, enabling closer alignment with System of Environmental-Economic Accounting (SEEA).

It serves as the global reference standard, underpinning key indicators such as GDP, national income and national wealth, and ensuring internationally comparable and policy-relevant economic statistics.

13. What changes are suggested in SNA 2025 for strengthening the national accounts framework?

System of National Accounts 2025 (SNA 2025), introduces a series of explicit changes and enhancements aimed at strengthening the national accounts framework in terms of well-being, sustainability, relevance and analytical depth.

1. **Stronger emphasis on well-being and sustainability**

SNA 2025 broadens the national accounts framework to better reflect well-being and its sustainability of well-being, without changing the core production boundary. It gives greater analytical importance to net measures, particularly Net Domestic Product (NDP), by treating the depletion of natural resources as a cost of production, alongside depreciation. This enables national accounts to better reflect the real economic costs of growth and resource use.

2. **Enhanced treatment of natural resources**

Natural resources are explicitly identified as a separate asset category within the asset classification. The framework adopts a split-asset approach, recognising that economic benefits from natural resources may be shared between legal owners and extractors. Renewable energy resources are also explicitly recognised, strengthening analysis related to energy transition and sustainability.

3. **Improved integration with environmental-economic accounting**

SNA 2025 strengthens conceptual linkages with the System of Environmental-Economic Accounting (SEEA), recognising it as a complementary framework. This improves consistency between economic statistics and environmental accounts and supports integrated analysis of the economy–environment relationship.

4. **Expanded measurement of distribution and inequality**

[11] https://unstats.un.org/unsd/nationalaccount/snaupdate/2025/chapters.asp

The framework introduces standard breakdowns for household income, consumption, saving and wealth by income and wealth deciles, with additional recommended breakdowns by household type, age and housing status. These changes strengthen the use of national accounts for analysing inequality and inclusiveness.

5. **Broader coverage through thematic and extended accounts**

SNA 2025 expands guidance on thematic and extended accounts, including unpaid household service work, health, education, training and human capital. These extensions enhance the analytical capacity of national accounts beyond traditional GDP-focused measures.

6. **Better reflection of modern economic realities**

New guidance addresses digitalisation, globalisation, financial innovation and emerging economic activities. Data are recognised as a new produced asset, and clearer treatment is provided for digital platforms, artificial intelligence–related activities and crypto assets, ensuring continued relevance of the framework.

7. **Improved coherence across macroeconomic statistics**

SNA 2025 is aligned with other macroeconomic statistical standards, including balance of payments and government finance statistics. This strengthens coherence across the macroeconomic statistical system and supports integrated economic analysis.[12]

14. What are natural resources as per SNA 2025?

As per the System of National Accounts 2025 (SNA 2025), natural resources are naturally occurring assets that provide economic benefits to their owners over time and are subject to ownership or control. They are treated as a category of non-produced non-financial assets within the national accounts because they are not created by economic production processes but exist due to natural processes.

Natural resources in SNA 2025[13] include assets such as land, mineral and energy resources, water resources, biological resources, and other naturally occurring assets that are used in economic activity or generate economic value. These resources are recognised in the balance sheets of the economy when ownership rights can be established and when they are capable of delivering future economic benefits, either through extraction, use, leasing, or provision of ecosystem-related services that are reflected in economic transactions.

SNA 2025 emphasises the importance of recording natural resources consistently with other assets to provide a more complete picture of national wealth and to support analysis of sustainability, depletion and long-term economic performance. It also strengthens the conceptual linkage between the SNA and environmental-

[12] https://unstats.un.org/unsd/nationalaccount/snaupdate/2025/2025_SNA_Combined.pdf

[13] https://www.oecd.org/en/publications/measuring-natural-resources-in-the-national-accounts_420c7c2a-en/full-report/measuring-natural-resources_a0accc5d.html#:~:text=In%20the%202025%20SNA%2C%20all,assets%20(excluding%20natural%20resources).

economic accounting frameworks, allowing better integration of environmental information with core economic statistics.

In summary, under SNA 2025, natural resources are recognised as economic assets of the economy, recorded on balance sheets, and valued in ways that reflect their role in supporting production, income generation and long-term economic well-being.

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15. How is the Environment Economic Accounting related to policy framing?

The SEEA responds to the need for information in four high-level policy areas:

(i) Economy and the environment: Information for policies in support of the management of natural resource supply and demand while reducing environmental impacts.
(ii) People and the environment: Information for policies in support of basic access to environmental services and natural resources.
(iii) Ecosystem Health: Information for policies in support of improving the state of the earth's ecosystems.
(iv) Mitigating Risks: Information for policies in support of mitigation and adaptation to extreme natural events.

16. What are the limitations of Environmental Measurements?

Some of the limitations of the Environmental Measurements are:

(i) Environmental measurements may sometimes be costly in terms of technological and human resources, especially for countries that wish to undertake complex monitoring programs.
(ii) Environmental measurement provides essential statistics to inform decision-making. But, sometimes working in silos hinders the usage of data of one agency by the other.
(iii) Some environmental measurement programs require considerable investments of time before results are available.

17. What is Ecosystem and Ecosystem Accounting?

An ecosystem[14] is a system in which the interaction between different organisms and their environment generates a cyclic interchange of materials and energy.

The Convention on Biological Diversity (CBD) defines an Ecosystem as "a dynamic complex of plant, animal and micro-organism communities and their non-living

[14] https://stats.oecd.org/glossary/detail.asp?ID=735

environment interacting as a functional unit"[15]. Examples of ecosystems are agroecosystem, aquatic ecosystem, forest ecosystem, marine ecosystem, urban ecosystem and others.

Ecosystem accounting is a coherent framework for integrating measures of ecosystems and the flows of services from them with measures of economic and other human activity. Ecosystem accounting complements, and builds on, the accounting for environmental assets as described in the System of Environmental Economic Accounting (SEEA) Central Framework (e.g. water resources, soil resources). In ecosystem accounting as described in the SEEA Ecosystem Accounting (SEEA EA), the accounting approach recognizes that these individual resources function in combination within a broader system and within a given spatial area.

It is an approach that can help answer questions such as:

(i) What is the contribution of ecosystems and their services to the economy, social wellbeing, jobs and livelihoods?
(ii) How is the condition, health and integrity of ecosystems and biodiversity changing over time and where are the main areas of degradation and enhancement?
(iii) How can natural resources and ecosystems be best managed to ensure continued services and benefits such as energy, food supply, water supply, flood control, carbon storage and recreational opportunities?
(iv) What are the trade-offs among different land uses (e.g. for agriculture, mining, housing development, habitat conservation, recreation) to achieve long-term sustainability and equity?

Ecosystem accounting does this by integrating biophysical and economic data using standard accounting principles and accounts to produce detailed measurements of the linkages between ecosystems and economic and other human activity. Because an ecosystem's contribution to human well-being is dependent on its location (for example, its proximity to human settlements), ecosystem accounts are inherently spatial.

18. What kind of information is contained in Ecosystem Accounts?

Ecosystem accounting can produce information on the extent of ecosystems, their condition based on selected indicators, and the flow of ecosystem services. Because of the spatial nature of ecosystem accounting, maps are a common method of presenting the information. The links between an ecosystem and the economy can be presented in both physical and monetary terms, often via combined presentations that show both kinds of data together, noting that monetary valuation is not a necessary feature of the accounts.

[15] CBD, article 2, entitled "Use of terms" https://www.cbd.int/convention/articles/?a=cbd-02

SEEA Ecosystem Accounting (SEEA EA) is an integrated statistical framework for organizing biophysical data, measuring ecosystem services, tracking changes in ecosystem assets and linking this information to economic and other human activity. It comprises a set of accounts that collectively present a coherent and comprehensive view of ecosystems.

(i) *Ecosystem Extent Accounts*: This account serves as a common starting point for ecosystem accounting. It organizes information on the extent of different ecosystem types (e.g. forests, wetlands, agricultural areas, marine areas) within a country in terms of area.

(ii) *Ecosystem Condition Account*: This account organizes biophysical information on the condition of different ecosystem types. The ecosystem condition account organizes data on selected ecosystem characteristics and the distance to a reference condition to provide insight into the ecological integrity of ecosystems.

(iii) *Ecosystem services flow account* (physical and monetary terms): This set of ecosystem accounts measures the supply of ecosystem services and the use of those services by economic units, including households, enterprises and government.

(iv) *Monetary Ecosystem Asset Account*: This account records information on stocks and changes in stocks (additions and reductions) of assets. The ecosystem monetary asset account records this information in monetary terms for ecosystem assets based on the monetary valuation of ecosystem services and applies 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.

19. What are Physical and Monetary Supply and Use Tables?

An economy uses natural resources and other inputs from the environment and lets the environment absorb the by-products. Measuring these flows using physical units can provide instructive information. The physical flow accounting framework provides a set of accounting principles and boundaries within which a consistent recording of all types of physical flows related to economic activity can be made.

The Physical Supply and Use Tables (PSUT) are accounts in physical units in the form of matrices that record the flows of natural resources, residuals, products and eco-systems inputs according to origins (supply) and destinations (uses). While the rows of the PSUT show types of natural inputs, products and residuals, the columns reflect both the activity underlying the flow and the economic units involved.

The Physical Supply tables provides information about the flows relating to the production, generation, and supply of natural inputs, products and residuals by different economic units or the environment.

The Physical Use tables provides information about the consumption and use of natural inputs, products and residuals by different economic units or the environment.

The Monetary Supply and Use Tables captures the supply and use of ecosystem services in monetary terms. The intent of Physical flow accounting is to record the physical flows underpinning the monetary supply and use tables and to extend the monetary table to record all physical flows from the environment to the economy and the environment.

20. What are Ecosystem Services?

In SEEA Ecosystem Accounting (SEEA EA), ecosystem services are defined as "the contributions of ecosystems to the benefits that are used in economic and other human activity." SEEA EA uses the following three broadly agreed on categories of ecosystem services:

(i) *Provisioning Services*: those ecosystem services representing the contributions to benefits that are extracted or harvested from ecosystems. E.g. Crop provisioning services, Aquaculture provisioning services, Wood provisioning services, etc.

(ii) *Regulating and maintenance services:* those ecosystem services resulting from the ability of ecosystems to regulate biological processes and to influence climate, hydrological and biochemical cycles, and thereby maintain environmental conditions beneficial to individuals and society. E.g. Climate regulation services, Air filtration services, Water filtration services, Soil and sediment retention services, Flood control services, etc.

(iii) *Cultural Services* are the experiential and intangible services related to the perceived or actual qualities of ecosystems whose existence and functioning contributes to a range of cultural benefits. E.g. Recreation related services, Visual amenity services, Education, scientific and research services, etc.

21. What is the valuation of Ecosystem Services?

Ecosystems contribute to economic activities by providing services that have economic value. The core valuation concept applied in the SNA and is also used in ecosystem accounting is that of exchange value, that is, the value at which goods, services, labour or assets are in fact exchanged or else could be exchanged for cash. The value is not generally visible in standard national accounts because, in most circumstances, they are not priced and not transacted in markets.

One of the purposes of SEEA Ecosystem Accounting is to provide sound statistical information on the economic value of ecosystem services and assets and present them in an accounting framework. Ecosystem services are defined as the contributions of ecosystems to benefits used in economic and other human

activity. Valuation of ecosystem services involves assigning a monetary value to these contributions to benefits rather than to the benefits themselves.

A range of techniques has been developed for the valuation of non-market transactions that can be applied for the purpose of providing estimates of the value of the supply and use of ecosystem services in monetary terms. The valuation of ecosystem services is meant to provide an estimate of the value of the contribution of ecosystems to economic production and consumption.

However, it should be noted that there exists a range of challenges with respect to the implementation of these techniques and the interpretation of the values that they yield.

22. What is Net Present Value (NPV)?

In the System of Environmental-Economic Accounting (SEEA), Net Present Value (NPV)[16] is defined as a valuation method used to estimate the value of an environmental asset by discounting the expected future stream of resource rents over the life of the asset to their value at the present time.

NPV represents the current worth of future economic benefits derived from an environmental asset, taking into account the time value of money. It is calculated by applying an appropriate discount rate to future flows of resource rent, recognising that income received in the future is worth less than income received today. In SEEA, the NPV approach is commonly used for valuing natural resource assets, such as mineral, energy, timber and other biological resources, where market prices for the asset itself are not directly observable.

In essence, within the SEEA framework, NPV provides a consistent way to translate future expected benefits from natural resources into present asset values for inclusion in environmental asset accounts.

23. What is Resource rent?

Resource rent is defined in the SEEA Central Framework as the return to the natural resource itself, after deducting all costs of extraction and a normal return to produced capital and labour from the value of output generated by exploiting the resource. In other words, it represents the surplus value attributable solely to the natural asset.

According to the SEEA Central Framework, resource rent is calculated as the value of output from extraction less intermediate consumption, compensation of employees, consumption of fixed capital, and a normal return to produced assets. The remaining amount reflects the contribution of the natural resource and is used as the basis for valuing natural resource assets and for measuring depletion.

[16] https://seea.un.org/content/seea-central-framework

24. What is discount factor?

The discount factor is used in the net present value (NPV) approach to convert future streams of resource rent into their present value when valuing natural resource assets. It reflects the principle that income received in the future is worth less than income received today.

In the SEEA Central Framework, the discount factor is derived from a chosen discount rate and is applied to future expected resource rents to estimate the current value of an environmental asset. The choice of discount rate directly affects the valuation of natural resources and the measurement of depletion over time, and it should be consistent with assumptions about time preference and risk.

25. What is the role of the United Nations Statistical Commission (UNSC))?

The United Nations Statistical Commission[17], established in 1946, is the highest body of the global statistical system bringing together the Chief Statisticians from member states from around the world. It is the highest decision making body for international statistical activities, responsible for setting of statistical standards and the development of concepts and methods, including their implementation at the national and international level.

The UNSC establishes groups to examine methodological issues, develop normative statistical guidance, and coordinate work among multiple international and national actors. These groups allow technical work to be carried out in a collaborative and inclusive manner, with outputs submitted to the Commission for discussion and possible endorsement.

The UNSC ensures that official statistics worldwide are credible, comparable, coordinated and policy-relevant. By providing a forum for agreement on standards, priorities and methods, it enables countries to operate within a common statistical framework that supports evidence-based decision-making and international cooperation.

26. What is the UN SEEA Knowledge Base?

The UN SEEA Knowledge Base is an online learning and reference platform developed by the United Nations to support the understanding, implementation and use of the System of Environmental-Economic Accounting (SEEA). It serves as a central hub that brings together conceptual guidance, methodological materials, training resources and practical tools related to SEEA.

The Knowledge Base is designed for national statistical offices, policymakers, researchers, students and practitioners working on environment-economic accounting. It provides structured access to:

[17] https://unstats.un.org/unsdwebsite/statcom/

- Explanations of SEEA concepts and frameworks
- Guidance on compiling SEEA Central Framework and SEEA Ecosystem Accounting
- E-learning courses and training modules
- Case studies, examples and country practices
- Links to manuals, handbooks and related resources

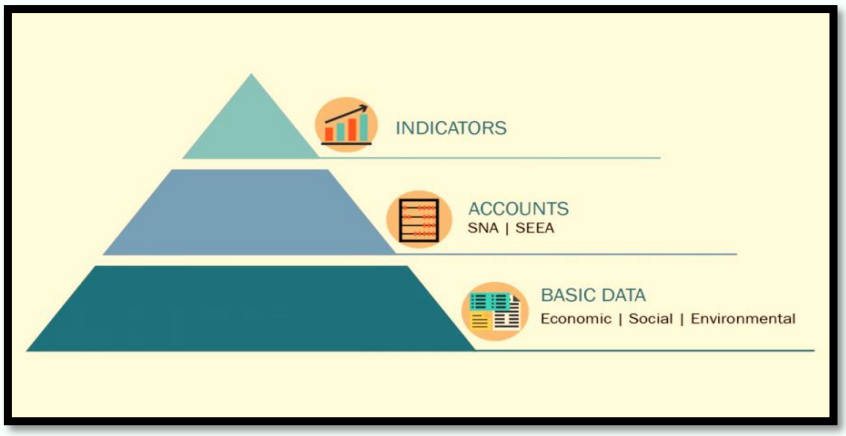
Overall, the UN SEEA Knowledge Base supports capacity building, consistency and quality in environmental-economic accounting by making authoritative SEEA knowledge easily accessible in one place , and can be accessed at (https://seea.un.org/content/knowledge-base).

27. How are Environmental Economic Accounts different from Environmental Statistics?

To place accounting frameworks in context it is relevant to consider the information pyramid. This pyramid has as its base a full range of basic statistics and data from various sources including surveys, censuses, scientific measurement and administrative sources. Generally, these data will be collected for various purposes with the use of different measurement scopes, frequencies, definitions and classifications. Each of these data sources will be relevant to the analysis or monitoring of specific themes.

The role of accounting frameworks (at the middle levels of the pyramid) is to integrate these data to provide a single best picture of a broader concept or set of concepts– for example, economic growth or ecosystem condition. The compiler of accounts must therefore reconcile and merge data from various sources considering differences in scope, frequency, definition and classification as appropriate.

Finally, having integrated the data within a single framework, indicators can be derived that provide insights into the changes in composition, changes in relationships between stocks and flows, and other features taking advantage of the underlying relationships in the accounts between stocks and flows, between capital and labour, between production and consumption, etc. Indicators such as GDP, national saving, national wealth, terms of trade and multi-factor productivity all emerge from the one national accounts framework.



Accounting & Modelling Tools for SEEA

28. What is ARIES ?

Artificial Intelligence for Environment & Sustainability (ARIES)[18] for SEEA was developed in response to the need for a globally applicable, transparent and scalable tool to support the implementation of SEEA Ecosystem Accounting, particularly in contexts where ecosystem accounting is constrained by limited data availability, technical capacity and modelling expertise. It builds on the broader ARIES initiative, which was designed to enable collaborative environmental sustainability analysis through shared data and models.

Artificial Intelligence for Environment & Sustainability (ARIES) is an open-source modelling platform developed by the Basque Centre for Climate Change under the NCAVES project. The ARIES for SEEA Explorer, built on this platform and hosted on the UN Global Platform, supports the rapid and standardised compilation of ecosystem accounts consistent with the SEEA Ecosystem Accounting framework for any user-defined area. It provides a web-based interface that uses global remote-sensing data, embedded models and artificial intelligence, particularly semantics and machine reasoning, to automatically integrate data and select appropriate models. The Explorer generates ecosystem extent, forest ecosystem condition and selected ecosystem service accounts in physical and monetary terms, along with a fully documented report of data sources and methods. It is designed to improve interoperability, transparency and efficiency in ecosystem accounting at national and sub-national levels.

29. What is ESTIMAP ?

ESTIMAP (Ecosystem Services Mapping Tool)[19] was developed to address the need for spatially explicit and policy-relevant information on ecosystem services,

[18] https://seea.un.org/content/aries-for-seea

[19] https://seea.un.org/sites/seea.un.org/files/biophysical_modelling_of_es_and_ecosystem_accounting_finallg.pdf

particularly to support land-use planning, environmental assessment and biodiversity policy. Earlier ecosystem service assessments often lacked spatial detail or comparability, limiting their usefulness for decision-making.

ESTIMAP (Ecosystem Services Mapping Tool) is a spatially explicit modelling approach that uses geographic information and land cover data to map and quantify the supply and distribution of ecosystem services across landscapes. It models the capacity of ecosystems to deliver services such as pollination, water retention, soil erosion control, air quality regulation and cultural benefits, and can be applied at multiple spatial scales, from regional to continental. ESTIMAP outputs help visualise where ecosystem services are generated, where they are used, and how they respond to changes in land use or management.

30. What is InVEST ?

InVEST was developed to support decision-making by improving understanding of how ecosystem condition and management choices influence the delivery of ecosystem services and human well-being. Policymakers and planners required tools that could assess multiple ecosystem services simultaneously and explore trade-offs arising from alternative development or conservation scenarios.

InVEST (Integrated Valuation of Ecosystem Services and Tradeoffs) is a collection of open-source models used for mapping and valuing ecosystem services in both terrestrial and aquatic environments. It provides tools to estimate the biophysical supply of services such as carbon storage, water yield, nutrient retention, pollination, coastal protection and habitat quality. The models link ecological structure and processes to service generation and produce outputs in physical units and, where relevant, economic terms. InVEST is widely applied to inform planning and policy decisions by illustrating trade-offs between alternative land management and policy scenarios and supporting ecosystem service assessment and accounting.[25]

Environmental Statistics

31. What is the history of compilation of Environment Statistics in India and how has it evolved in line with international frameworks?

The systematic development of environment statistics globally began with the publication of the Framework for the Development of Environment Statistics (FDES) by the United Nations Statistics Division in 1984, which provided a conceptual basis for organizing environmental data by linking environmental conditions with human activities, impacts and societal responses. This was

followed by methodological guidance, development of environmental indicators, global data collections, and establishment of international coordination mechanisms to strengthen consistency and comparability of environment statistics.

In India[20], the compilation of environment statistics commenced in the early 1980s with institutional arrangements within the National Statistical Office under the Ministry of Statistics and Programme Implementation, with the Social Statistics Division playing a central coordinating role in developing environment statistics alongside other social domains. A multidisciplinary Working Group in 1986 and a Steering Committee in 1996 laid the foundation for systematic compilation, leading to publication of the Compendium of Environment Statistics – India from 1997 onwards till 2016. Climate-related indicators were later compiled through Climate Change Statistics in India (2013 and 2015) using the DPSIR framework. Following adoption of FDES 2013, these publications were merged in 2018 into EnviStats–India: Environment Statistics, providing a harmonised framework for dissemination.

32. How are Environmental Economic Accounts different from Environmental Statistics?

To place accounting frameworks in context it is relevant to consider the information pyramid. This pyramid has as its base a full range of basic statistics and data from various sources including surveys, censuses, scientific measurement and administrative sources. Generally, these data will be collected for various purposes with the use of different measurement scopes, frequencies, definitions and classifications. Each of these data sources will be relevant to the analysis or monitoring of specific themes. The role of accounting frameworks (at the middle levels of the pyramid) is to integrate these data to provide a single best picture of a broader concept or set of concepts– for example, economic growth or ecosystem condition. The compiler of accounts must therefore reconcile and merge data from various sources considering differences in scope, frequency, definition and classification as appropriate. Finally, having integrated the data within a single framework, indicators can be derived that provide insights into the changes in composition, changes in relationships between stocks and flows, and other features taking advantage of the underlying relationships in the accounts between stocks and flows, between capital and labour, between production and consumption, etc. Indicators such as GDP, national saving, national wealth, terms of trade and multi-factor productivity all emerge from the one national accounts framework..

33. What is the Framework for Development of Environment Statistics (FDES)?

The Environment statistics[21] cover a wide range of information and are multi and interdisciplinary in nature. They originate from a variety of institutions that collect

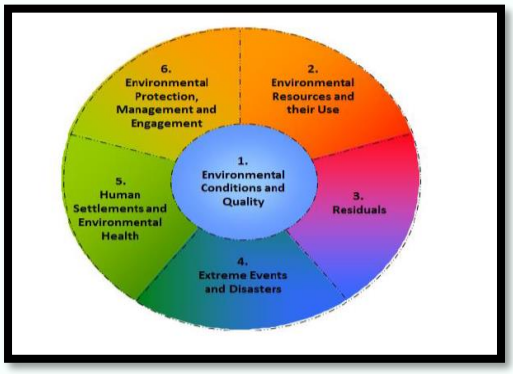
[20] https://mospi.gov.in/sites/default/files/reports_and_publication/cso_social_statices_division/comp_CHAPTER_TWO6jan12.pdf
[21] *https://unstats.un.org/unsd/environment/FDES/FDES-2015-supporting-tools/FDES.pdf*

data and, similarly, numerous methods are used to compile them. The field of environment statistics requires an appropriate framework to guide its development, coordination and organization.

The Framework for the Development of Environment Statistics (FDES) is a flexible, multi-purpose conceptual and statistical framework that is comprehensive and integrative in nature. It marks out the scope of environment statistics and provides an organizing structure to guide the collection and compilation of environment statistics at the national level. It brings together data from the various relevant subject areas and sources. It is broad and holistic in nature, covering the issues and aspects of the environment that are relevant for policy analysis and decision making by applying it to cross-cutting issues such as climate change.

The current FDES 2013 is structured in a way that allows links to economic and social domains. It seeks to be compatible with other frameworks and systems, both statistical and analytical, such as the System of Environmental-Economic Accounting (SEEA), the Driving force, Pressure-State-Impact-Response (DPSIR) framework, and the Millennium Development Goals (MDGs) and Sustainable Development Goals (SDGs). When applicable, it is based on existing statistical classifications. As such, the FDES facilitates data integration within environment statistics and with economic and social statistics. FDES comprises of 6 components:

(i) Environmental conditions and quality
(ii) Environmental resources and their use
(iii) Residuals
(iv) Extreme events and disasters
(v) Human settlements and environmental health
(vi) Environmental protection, management and engagement



34. What are the different tiers of the Framework for the Development of Environment Statistics (FDES)?

In FDES 2013, tiers classify environmental indicators based on their priority, data availability, and methodological readiness to help countries develop environment statistics in a phased manner. **Tier I** indicators form the Core Set, are highly relevant, methodologically well established, and can be produced in the short term. **Tier II** indicators are important but require greater resources or institutional capacity and are suited for medium-term development. **Tier III** indicators are either lower priority or still methodologically evolving and are intended for long-term development. The tier system reflects feasibility and readiness, not the importance of environmental issues.

35. How many indicators are there under Tier-I, Tier-II and Tier-III for each component of the Framework for the Development of Environment Statistics (FDES) ?

FDES Component	Tier-I	Tier-II	Tier-III	Total
Component 1: Environmental Conditions and Quality	32	58	51	**141**
Component 2: Environmental Resources and their Use	30	51	43	**124**
Component 3: Residuals	19	34	5	**58**
Component 4: Extreme Events and Disasters	4	11	16	**31**
Component 5: Human Settlements and Environmental Health	12	22	20	**54**
Component 6: Environmental Protection, Management and Engagement	3	24	23	**50**
Total	**100**	**200**	**158**	**458**

Table – Distribution of Statistics by Tier and Component.[22]

36. What does the "Environmental Conditions and Quality" component of FDES cover?

Environmental conditions and quality describe the physical, biological and chemical characteristics of the environment and their changes over time. These conditions form the fundamental background against which ecosystems exist and function. The component is central to the framework, as it determines the types, extent, condition and health of ecosystems, and strongly influences all other environmental components.

This component covers statistics related to meteorological, hydrographical, geological and geographical conditions, along with soil characteristics, land cover, ecosystem extent, biodiversity and environmental quality. These environmental

[22] https://unstats.un.org/unsd/environment/fdes/FDES-2015-supporting-tools/FDES.pdf
Table 4.1 – Distribution of Statistics by Tier and Component.

characteristics are closely interrelated and collectively reflect the overall state of environmental health.

Environmental condition statistics function in a manner similar to vital signs for the human body: they help identify emerging environmental problems, assess environmental stress, and track recovery following interventions. For policymakers, these statistics provide essential evidence to evaluate the need for policy action and the effectiveness of environmental measures. As a result, this component lays the groundwork for informed decision-making, policy formulation, sustainable development planning, data management and dissemination.[23]

Key indicators include:

- Climate and weather indicators (temperature, precipitation, extreme climate conditions)
- Atmospheric conditions (air quality, ambient concentrations of pollutants)
- Water quality indicators (surface water and groundwater quality parameters)
- Soil quality and degradation indicators
- Land cover and land use indicators
- Ecosystem extent and ecosystem type distribution
- Biodiversity indicators (species diversity, threatened species)
- Environmental noise indicators

37. What does the Environmental Resources and their Use component of FDES comprise?

Environmental resources are natural assets provided by the Earth that support both production and consumption activities. These resources include land, water, air, forests, minerals, energy resources, soil and biological resources, each of which plays a vital role in sustaining human life, economic activity and ecosystem functioning.

This component focuses on statistics related to the availability, stocks and changes in environmental resources, as well as their use by human activities. It captures how resources are extracted, transformed and consumed, and how their use affects long-term availability.

The purpose of this component is to support sustainable management of environmental resources, ensuring that present use does not compromise future

[23] https://www.mospi.gov.in/sites/default/files/reports_and_publication/statistical_publication/EnviStats/Overview24.pdf

needs. Reliable statistics on resource availability and use help policymakers assess risks such as shortages, dependency, over-exploitation and competing demands, and support planning for continued and equitable access to resources over time.[23]

Key indicators include:

- Land resources (land area by type and use)
- Water resources (renewable water resources, abstraction and use)
- Forest resources (forest area, growing stock, biomass)
- Energy resources (fossil fuel reserves, renewable energy resources)
- Mineral resources (reserves and extraction)
- Biological resources (fish stocks, wildlife resources)
- Resource extraction and harvesting indicators
- Resource use efficiency indicators

38. What does the Residuals component in FDES describe ?

Residuals represent the materials, substances and energy flows generated by human production and consumption activities that are released into the environment. These include solid, liquid and gaseous substances, as well as energy, that are discarded, discharged or emitted by households and establishments.

This component focuses on statistics related to the generation, management and final release of residuals. Residuals may enter the environment directly or may be captured, collected, treated, recycled or reused before release. They include emissions to air, discharges to water, deposition to soil, wastewater, waste and releases associated with chemical substances.

The component emphasizes that pollutants, once released, can spread across ecosystems, affecting human health and environmental integrity. By organizing information on residuals, this component supports understanding of environmental pressures created by economic activities, highlights the importance of pollution control and waste management, and informs strategies to improve environmental quality and protect ecosystem and public health. [23]

Key indicators include:

- Air emissions (greenhouse gases, air pollutants)
- Wastewater generation and discharge
- Solid waste generation and treatment
- Hazardous waste generation and management
- Chemical releases and transfers
- Emissions to soil and water
- Recycling and recovery indicators

39. What does the Extreme Events and Disasters component of FDES cover?

Extreme events and disasters refer to sudden and severe environmental or technological events that cause significant damage to human life, property, livelihoods and ecosystems. These events include both natural phenomena and technological failures, and their impacts are often intensified by human activities such as climate change, land-use change and urbanization.

This component organizes statistics related to the occurrence, frequency, intensity and impacts of extreme events and disasters. It highlights the importance of understanding disasters not only as isolated incidents but as recurring risks that require preparedness, mitigation and adaptation.

By compiling information on extreme events and disasters, this component supports risk assessment, disaster management planning and policy formulation.

It helps governments and institutions design early warning systems, improve resilience, and reduce vulnerability to future disasters. [23]

Key indicators include:

- Occurrence and frequency of natural disasters
- Types of extreme events (floods, droughts, storms, heatwaves, earthquakes)
- Disaster-affected areas
- Population affected by disasters
- Economic losses due to disasters
- Environmental impacts of disasters
- Disaster risk and exposure indicators

40. What does the Human Settlements and Environmental Health component of FDES comprise?

This component focuses on the interaction between human populations, their living environments and environmental conditions, and how these interactions affect health and well-being. It encompasses both human settlements and environmental health as closely linked subcomponents.

Human settlements include the population living in urban and rural areas, along with physical structures such as housing and infrastructure, access to services like water, sanitation, transport and energy, and exposure to environmental risks. These settlements both depend on and exert pressure on the natural environment through resource extraction, land use, waste generation and pollution.

Environmental health examines how environmental factors influence human health, focusing on diseases and conditions associated with air, water, sanitation, hygiene and environmental degradation. This component highlights the role of environmental conditions in shaping public health outcomes and underscores the need for sustainable settlement planning and improved environmental services to maintain healthy living conditions. [23]

Key indicators include:

- Population distribution (urban and rural)
- Housing conditions and infrastructure
- Access to safe drinking water
- Access to sanitation and hygiene services
- Waste collection and disposal coverage
- Exposure to environmental pollution
- Environment-related diseases
- Urban environmental conditions

41. What is Environmental Protection, Management and Engagement component of FDES?

This component addresses the societal response to environmental challenges, focusing on how governments, institutions, businesses and communities act to protect the environment and manage resources sustainably.

It organizes information related to environmental policies, regulations, institutions, management practices, expenditure, public awareness, education and participation. The component recognizes that effective environmental protection requires not only sound policies and regulations but also strong institutions, adequate funding, informed citizens and active public engagement.

By compiling statistics on environmental protection and management efforts, this component helps assess the effectiveness of environmental governance, track progress towards environmental goals, identify gaps in policy implementation, and promote transparency and accountability. It plays a critical role in understanding how societies respond to environmental pressures and in shaping more effective and inclusive environmental strategies. [23]

Key indicators include:

- Environmental protection expenditure
- Environmental taxes and subsidies
- Environmental policies and regulations
- Protected areas and conservation measures
- Environmental institutions and governance
- Environmental monitoring systems
- Public awareness and education indicators
- Participation in environmental decision-making

42. What is Climate Change?

Climate Change refers to any significant change in the measures of climate lasting for an extended period of time. In other words, climate change includes major changes in temperature, precipitation, or wind patterns, among others, that occur over several decades or longer. Climate Change may be due to:

- Natural internal and external forces such as modulations of the solar cycles, volcanic eruptions
- Persistent anthropogenic changes in the composition of the atmosphere or in land use.

The United Nations Framework Convention on Climate Change (UNFCCC) defines climate change as a change of climate which is attributed directly or indirectly to

human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.

43. What is Ambient Air Quality Monitoring?

Ambient air quality refers to the condition of the air in the surrounding outdoor environment, usually measured by the concentration of pollutants present in the air. It is commonly assessed by monitoring pollutants such as particulate matter ($PM_{2.5}$ and PM_{10}), sulphur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), carbon monoxide (CO), and lead (Pb), which may have adverse effects on human health and the environment.[24]

Ambient air quality monitoring is required to determine the existing quality of air, evaluation of the effectiveness of control programme and to identify areas in need of restoration and their prioritization.

Air quality monitoring is undertaken to establish baseline (background) data on existing contamination levels and to anticipate potential future impacts; to evaluate the status and long-term trends of air pollution in order to assess the effectiveness of control strategies and determine the need for additional measures; to determine environmental exposure levels by analysing the relationships among pollution sources, atmospheric parameters, and observed effects; to understand the natural scavenging and cleansing processes of the environment such as dilution, dispersion, deposition, precipitation, and chemical transformation of pollutants; and ultimately to support effective air quality management by assessing current conditions and guiding both immediate and long-term pollution control and planning efforts.[25]

44. What is Water Quality Monitoring?

Water quality monitoring is the process of sampling, measuring and analysing the physical, chemical and biological characteristics of water bodies to determine their suitability for various uses such as drinking, irrigation, industrial use and ecological sustainability.

45. What is Marine Water Quality?

Marine water quality refers to the chemical, physical and biological characteristics of seawater that influence marine ecosystems and human uses such as fisheries,

[24] https://www.who.int/teams/environment-climate-change-and-health/air-quality-energy-and-health

[25] https://mpcb.gov.in/sites/default/files/focus-area/air-quality/Ambient_Air_quality_Monitoring_Guidlines.pdf

tourism and coastal livelihoods. Monitoring marine water quality helps assess pollution, eutrophication and ecosystem health in coastal and ocean environments.[26]

46. What is Ambient Noise?

Ambient noise is the total amount of sound present in the environment at a given place and time, arising from sources such as traffic, industrial activities, construction, and social activities. Ambient noise levels are measured to assess exposure to noise pollution and its impact on human health.[27]

47. Who coordinates and provides guidance for the compilation of environment and climate change statistics under the international statistical framework?

The coordination and technical guidance for compiling environment and climate change statistics is provided by the Expert Group on Environment Statistics (EGES)[28]. EGES is an international technical group established by the United Nations Statistics Division in 2014 to support the implementation of the Framework for the Development of Environment Statistics (FDES 2013) in countries. The Group brings together experts from UN Member States and international and regional organisations to standardise methods, classifications and definitions, develop methodological tools and guidance, and promote training and capacity building for environment statistics. EGES works on improving data collection, processing and dissemination of environment statistics, particularly in key areas such as water and waste, and assists countries in compiling statistics that support environmentally related Sustainable Development Goal indicators. Recognising the close links between environment and climate change, the UN Statistical Commission expanded the mandate of EGES to cover climate change statistics as well, following which the Group was renamed the Expert Group on Environment and Climate Change Statistics (EG-ECCS). EG-ECCS meets annually to review progress, support countries' statistical programmes, strengthen harmonisation of environment and climate change statistics, and guide methodological development for future work.

In alignment with this international engagement, the Ministry of Statistics and Programme Implementation regularly compiles and disseminates environment and climate change related statistics in accordance with the FDES framework. Following the adoption of FDES 2013, the annual publication *EnviStats–India* is brought out to present indicators covering all six components of FDES, namely Environmental Conditions and Quality, Environmental Resources and their Use, Residuals, Extreme Events and Disasters, Human Settlements and Environmental Health, and Environmental Protection, Management and Engagement. The data presented in *EnviStats–India* are compiled based on inputs received from various

[26] https://www.noaa.gov/education/resource-collections/ocean-coasts/ocean-pollution

[27] https://cpcb.nic.in/noise-pollution/

[28] 1) https://unstats.un.org/unsd/envstats/fdes/EGES11/1New%20EG%20ECCS.pdf
2)https://unstats.un.org/unsd/envstats/fdes/fdes_eges.cshtml

Ministries, Departments and Organisations of the Government of India. Climate change mitigation related indicators, including those related to energy and emissions, are organised as per the FDES structure to facilitate consistency with international statistical practices. Further, an Inter-Ministerial Group comprising representatives from line Ministries and Departments has been constituted to support improvements in indicator coverage, identification of data sources and presentation of climate change related statistics, thereby complementing international collaboration with strong national coordination.

48. Where can one find the glossary of all the items used in the EnviStats India publication?

NSO, India releases 'EnviStats India Glossary' which encompasses all the terms and definitions used in the EnviStats India publication at a single platform. This will help the user to have a better understanding of the various definition and technical terms used in EnviStats India publications. The glossary is updated in line with the subsequent release of the publications. The publications can be accessed at https://www.mospi.gov.in. From 2025 onwards, the glossary of terms and definitions has been included in a dedicated publication on environmental accounting

Environmental Accounting in India

49. Who compiles Environment Accounts/Statistics in India? What are the data sources?

The National Statistical Office, Ministry of Statistics and Programme Implementations (NSO, MoSPI) under the Government of India (GoI) is mandated to serve as the nodal agency for planning and facilitating an integrated development of the statistical system in the country. As per the Allocation of the Business rules, NSO, MoSPI has the mandate for the development of Environment Statistics, the development of the methodology, concepts and preparation of Natural Resource Accounts in India.

NSO, MoSPI initiated the compilation of environmental accounts in the SEEA framework in 2018, and these accounts were released in the publication titled "EnviStats-India- Environment Accounts". Since then, NSO, MoSPI has been regularly releasing the accounts on environment. NSO, MoSPI also regularly releases Environment Statistics in the annual publication titled "EnviStats-India: Vol. I – Environment Statistics" following the FDES-2013 framework. The publications are available at the Ministry's website (https://www.mospi.gov.in).

The data are sourced from different Ministries/Departments of Government of India such as the Ministry of Agriculture and Farmers Welfare, Ministry of Jal Shakti, Nation Remote Sensing Centre, Ministry of Environment, Forest and Climate Change etc.

50. What is the history of Environmental Accounts in India?

India has a long history of research on environmental aspects including ecosystem services, ranging from theoretical concepts to practical applications and internalization of study outcomes into policies. These studies had been carried out in the areas of forest, wetland, coastal, marine & mangrove and others.

These studies covered a wide range of issues – from the application of economic principles and tools to environmental management in India for policies related to pollution control, resources management and biodiversity conservation and from quantifying the resourcefulness of India to highlighting the economic consequences of the loss of biological diversity and the associated decline in ecosystem services. But despite having the vast richness of findings of these research studies, a full-fledged account could not be compiled due to the lack of comparability in the methods and definitions used in these studies which limited their aggregation

In order to help the official system to come up with the environmental economic accounts, a high-level Expert Group under the Chairmanship of Prof. Sir Partha Dasgupta, Frank Ramsey Professor Emeritus of Economics, University of Cambridge, U.K. was constituted by MoSPI in 2011 with the mandate of developing a framework for green national accounts of India and preparing a roadmap to implement the framework. The Expert Group submitted its report titled "Green National Accounts in India-A Framework" in 2013 which included a roadmap for implementing the Green Accounting Framework.

The Expert Group in its report recommended the compilation of the accounts as envisaged in SEEA Central Framework in a phased manner (such as the Asset accounts and the Supply and Use tables).

51. How does the Ministry of Statistics and Programme Implementation (MoSPI), contribute to the compilation of climate change indicators in India under global statistical frameworks, and what are the key institutional data sources?

Various Ministries/Departments/Institutions/Organization are involved in the compilation of various statistics pertaining to climate change. These are Indian Metrological Department (IMD), National Remote Sensing Centre (NRSC), Forest Survey of India (FSI), ENVIS Centres of MoEF&CC, etc. NSO, MoSPI collates and compile the information/statistics collected by organization/institutions and release in the form of publication. NSO, MoSPI released two issues of the publication "Climate Change Statistics in India" in 2013 and 2015[29] based on DPSIR Framework. Later on, with the release of FDES 2013 Framework in 2016, the publications "Compendium of Environment Statistics" and the "Climate Change Statistics in India" were merged in 2018 and a new publication titled "EnviStats-India: Vol. I: Environment Statistics" was conceptualized following the FDES framework. Till date eight issues have been brought out by the Ministry.

[29]https://mospi.gov.in/documents/213904/301563//climateChangeStat20151619801113578.pdf/63fc6cb2-e690-bbdb-9df9-c6fa2db1d6c1

52. What is the Natural Capital Accounting and Valuation of Ecosystem Services (NCAVES) Project?

The project "Natural Capital Accounting and Valuation of Ecosystem Services" (NCAVES) was launched in 2017 with an aim to advance both the knowledge agenda and the development of policy applications of environmental-economic accounting, in particular for ecosystem accounting. The NCAVES project was funded by the European Union via a Partnership Instrument and has been jointly implemented by the United Nations Statistics Division (UNSD) and the United Nations Environment, in collaboration with the Convention on Biological Diversity (CBD).

The project initiated pilot testing of SEEA Ecosystem Accounting (SEEA EA) in five participating partner countries, namely Brazil, China, India, Mexico and South Africa, with a view to improving the measurement of ecosystems and their services (both in physical and monetary terms) at the (sub)national level; mainstreaming biodiversity and ecosystems at (sub)national level policy planning and implementing and contributing to the development of internationally agreed methodology and its use in partner countries.

53. Who implemented the NCAVES project in India?

In India, the NCAVES project was implemented by the National Statistical Office, Ministry of Statistics and Programme Implementations (NSO, MoSPI) in close collaboration with the Ministry of Environment, Forest and Climate Change (MoEFCC), National Remote Sensing Centre (NRSC), the Soil and Land Use Survey of India (SLUSI) and the Indian Institute of Science (IISc)-Centre for Ecological Sciences. NSO, MoSPI has coordinated with all the stakeholders through a consultative process by setting in place a mechanism for linking the diverse stakeholders concerned-namely producers and the policymakers-using the environmental accounts.

With a view to facilitate this collaboration and highlight the uses to which natural capital accounts can be put, especially in the areas of decision making and policy analysis, the Ministry conducted the NCAVES India Forum (in a virtual format), as a series of three sessions in January 2021 held on January 14, 21 and 28, 2021 and released NCAVES India Project Report. The Report is available on the Ministry's website.

54. What is Inter-Ministerial Group (IMG)? How does it support coordination, guidance, and monitoring of Environment Statistics and Environmental-Economic Accounts in India?

Since the data for compilation of the Environment Statistics/Accounts are sourced from multiple agencies, NSO, MoSPI constituted an Inter-Ministerial Group (IMG) on Environmental-Economic Accounting, under the chairmanship of the Director General, CSO (Central Statistical Office) in 2015 primarily to assess the availability

of data for compilation of Environmental Economic Accounts and to recommend measures for filling the data gaps

In December 2025, the IMG was reconstituted and merged with the Expert Group on Environment Statistics under the chairmanship of the Director General (Central Statistics), by incorporating the environment statistics dimension.

The Inter-Ministerial Group (IMG) comprises stakeholders from various Ministries/Departments. The role of the IMG is as follows:

- Assessment of availability of data for the compilation of Environmental Economic Accounts (SEEA framework) and Environment Statistics (FDES 2013).
- Identification of indicators having multiple sources and recommending measures for selecting the appropriate indicators for compiling environment statistics and environmental economic accounts.
- Identification of data gaps and recommend measures for filling the data gaps.
- Assessment of Resource requirements and capacity development.
- Suggestions for enhancing the coverage and scope of the publications on environment statistics and environmental economic accounts.
- Provide guidance and support to the team on technical decisions and processes.
- To suggest roadmap for implementation of sector wise accounts.
- Other subject matters as and when emerge.

55. What is the role of the Expert Group on Environment Statistics in providing technical guidance and strengthening the framework for environment statistics and environmental-economic accounting in India?

The Expert Group on Environment Statistics in India was constituted by the Ministry of Statistics and Programme Implementation in August 2011 to develop a framework for integrating environmental considerations into national accounting. The Group submitted its report titled *"Green National Accounts in India – A Framework"* in March 2013. Following the Government's acceptance of the Group's recommendations to implement the System of Environmental-Economic Accounting in India, an Inter-Ministerial Group was constituted in January 2015 under the chairmanship of the Director General, Central Statistics Office, to oversee implementation of Environmental-Economic Accounting. Subsequently, with the approval of the competent authority in December 2025, this Inter-Ministerial Group was reconstituted and merged with the Expert Group on Environment Statistics under the chairmanship of the Director General, Central Statistics, thereby strengthening institutional arrangements by integrating both environmental-economic accounting and environment statistics within a single expert mechanism.

56. How do Inter-Departmental Groups (IDGs) facilitate coordination, data sharing, and monitoring for the compilation of Environment Accounts?

Inter-Departmental Groups (IDGs) are coordination mechanisms constituted at the State and Union Territory level to support the compilation of Environment Accounts. They are formed to bring together relevant State departments that hold granular, sector-specific data essential for producing robust and comprehensive environmental-economic statistics. In 2023, the Ministry of Statistics and Programme Implementation requested all States and Union Territories to constitute IDGs, on the lines of the Inter-Ministerial Group at the national level, with the Directorate of Economics and Statistics (DES) designated as the nodal agency.

The primary objective of IDGs is to strengthen inter-departmental coordination, ensure timely and smooth flow of data, and improve the quality and consistency of sub-national environmental statistics. The formation of IDGs and availability of comprehensive State-level data are considered critical for generating credible and policy-relevant Environment Accounts that support national and global commitments, including the Sustainable Development Goals (SDGs). IDGs have been constituted in several States and Union Territories, while follow-up and reminders are being issued to encourage formation in the remaining regions.

57. What are the different ecosystem accounts that have been attempted by NSO, India?

NSO, India regularly compiles environment accounts since 2018 following the SEEA framework and has carried out several accounts since then. India has developed several extent and condition as well as ecosystem services accounts for various selected ecosystems. A brief description is given below:

Type of account	Topics covered
Ecosystem extent	• *Wetland Extent Account (2020, 2022)* • *Cropland Ecosystem Extent Account (2020)* • *Forest Extent Account (2025)*
Ecosystem condition	• Soil nutrient indices (2019, 2021, 2024) • Forest condition accounts (2020, 2022,2025) • Cropland condition accounts (2020)
Ecosystem services	• Crop provisioning services (monetary) (2019, 2021) • Timber provisioning services (monetary) (2020, 2022, 2025) • Non-Timber Forest Products (NTFP) provisioning services (monetary) (2020, 2022, 2025) • Fish Provisioning services (monetary) (2022, 2023)

Type of account	Topics covered
	• Carbon retention services provided by forests (physical and monetary) (2020, 2022) • Nature-based tourism (monetary) (2019) • **Pollination services** (2026) • Soil erosion prevention services provided by croplands/ Forests (physical) (2020, 2023)
Thematic Accounts	• Biodiversity (2020, 2021, 2022, 2024) • State-wise floral and faunal species accounts (2020) • Species Richness of IUCN Red List species (2020, 2021, 2022, 2024) • Coastal Water Quality Index (2019); Ocean Accounts (2024), Ocean Ecosystem Accounts Framework (2025)
Individual environmental asset accounts (SEEA CF)	• Forests – Growing Stocks of Timber and Carbon (2018, 2020, 2022, 2025) • Asset Account & Change matrix of Land Use–Land Cover (LULC) (2018, 2020); Wasteland Account (2020) • Land Degradation Accounts (2020) • Water (2018); Water Quality Accounts (2019) • Minerals (2018) • Energy Accounts (2022, 2024) • Solid Waste Accounts (2022, 2023)
Physical Supply Use Table	• Energy • Solid Waste

Apart from this, NSO, India constantly strives towards improving the scope and coverage of the Environmental Accounts in India.

58. What are the other organisations involved in Environment accounting in India?

Apart from MoSPI, the natural resource accounting is being dealt by Government Accountings Standards Advisory Board (GASAB) under the aegis of Comptroller and Auditor General of India. In line with its mandate in suggesting accounting framework for enhancing the quality of decision making and public accountability in mind, GASAB has initiated the efforts by preparing a roadmap for implementation of NRA in India. GASAB[30] has initially proposed preparation of the Asset accounts in the States and then gradually expand it to the nation and in this

[30] http://gasab.gov.in/gasab/pdf/NR-Accounting.pdf

direction, GASAB released 'Compendium of Asset Accounts of Mineral and Energy Resources in India'[31] in 2022.

59. To what extent India collaborates with the International agencies regarding environment accounting?

NSO, India joined the EU funded Natural Capital Accounting and Valuation of Ecosystem Services (NCAVES) India project in 2017 which was jointly implemented by the United Nations Statistics Division (UNSD), United Nations Environment Programme (UNEP) and the Secretariat of the Convention of Biological Diversity (CBD) in five piloted countries-the other countries being Brazil, China, South Africa and Mexico. A large amount of the work on the Environment Accounting in India has been done under the MoEF&CC project.

The UN Committee of Experts on Environmental-Economic Accounting (UNCEEA), established by the UN Statistical Commission at its 36th session in March 2005, functions as an intergovernmental body to provide overall vision, coordination, prioritization and direction in the field of environmental economic accounting and supporting statistics. The Bureau of the UNCEEA was established in 2007 to assist the Committee to carry out specific activities pertaining to Environment Accounts. India is a member of the Bureau of UN Committee of Experts on Environmental-Economic Accounting (UNCEEA).

The Global Assessment of Environmental-Economic Accounting and Supporting Statistics is a survey administered under the auspices of the UN Committee of Experts on Environmental-Economic Accounting (UNCEEA). The aim of the Global Assessment is to assess the progress of implementation of the SEEA in countries. NSO, India provides regular responses to the Global Assessment of Environmental-Economic Accounting and Supporting Statistics, conducted UNSD.

In addition, India regularly contributes to SEEA News and Notes newsletter highlighting the achievements in Environment Statistics and Environment Accounts. NSO, India also actively participates in meetings of London Group on Environment Accounting which serves as a forum to advance methodological research and to develop implementation advice for the SEEA. In addition, NSO, India provides critical inputs and feedback on various issues relating to Environment Statistics and Accounts in the annual sessions of UNSC.

NSO, India joined Global Ocean Accounts Partnership (GOAP) in 2020 and is making efforts to develop India's Ocean Ecosystem Accounts. The Global Ocean Accounts Partnership (GOAP) is a global, multistakeholder partnership established to enable countries and other stakeholders to go Beyond GDP to measure and manage progress towards ocean sustainable development. Co-Chaired by the United Nations Economic and Social Commission for Asia and the Pacific and Fisheries and Oceans Canada, GOAP brings together governments,

[31] https://gasab.gov.in/gasab/pdf/Compendium-of-Asset-final.pdf

international organisations and research institutions to build a global community of practice for ocean accounting.

Environment & Sustainability

60. What are Sustainable Development Goals (SDGs)?

According to the Brundtland Report (1987), "Sustainable development is a development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

The Sustainable Development Goals (SDGs)[32], also known as the Global Goals, were adopted by the United Nations in 2015 as a universal call to take action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity.

The 17 SDGs are integrated—they recognize that action in one area will affect outcomes in others and that development must balance social, economic and environmental sustainability. The 17 SDG goals to transform our world include:

GOAL 1: No Poverty
GOAL 2: Zero Hunger
GOAL 3: Good Health and Well-being
GOAL 4: Quality Education
GOAL 5: Gender Equality
GOAL 6: Clean Water and Sanitation
GOAL 7: Affordable and Clean Energy
GOAL 8: Decent Work and Economic Growth
GOAL 9: Industry, Innovation and Infrastructure
GOAL 10: Reduced Inequality
GOAL 11: Sustainable Cities and Communities
GOAL 12: Responsible Consumption and Production
GOAL 13: Climate Action
GOAL 14: Life Below Water
GOAL 15: Life on Land
GOAL 16: Peace and Justice Strong Institutions
GOAL 17: Partnerships to Achieve the Goal

Countries have committed to prioritize progress for those who are furthest behind. The SDGs are designed to end poverty, hunger, and discrimination against women and girls. The creativity, know how, technology and financial resources from all of society is necessary to achieve the SDGs in every context.

[32] https://www.undp.org/sustainable-development-goals

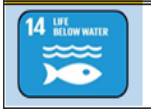
61. How is Environment linked with Sustainability?

The 2030 Agenda for sustainable development highlights the interlinkages and integrated nature of the sustainable development goals implying clearly that this global policy agenda which links goals across many sectors requires integrated statistics for monitoring progress. The implementation of the SEEA is in and of itself an SDG indicator (15.9.1: (a) Number of countries that have established national targets in accordance with or similar to Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011–2020 in their national biodiversity strategy and action plans and the progress reported towards these targets; and (b) integration of biodiversity into national accounting and reporting systems, defined as implementation of the System of Environmental-Economic Accounting). Owing to their integrated nature, ecosystem accounts that are formed under the ambit of the SEEA framework, whether they are extent accounts, condition accounts or ecosystem service accounts provide an underpinning that informs the 2030 Agenda for Sustainable Development. The UNSC recognized SEEA as an important statistical framework for the post-2015 development agenda and the Sustainable Development Goals indicators in 2015. Analysis suggests that 40 of the SDG indicators covering 9 of the 17 goals could be derived from the SEEA.

Of the three dimensions of sustainable development, the environmental dimension remains the least well measured. Increased global effort to ensure that measurement is done consistently and to high standards across all regions of the planet is needed. Only then one can be sure that the environmental SDGs will be reported with the same quality as those that consider social and economic issues

The SEEA-CF is the basis for measuring a country's natural wealth, or the value of its natural capital. Natural wealth is in turn an essential input in measuring inclusive wealth, which is an important indicator of the sustainability of well-being.

The following image shows the linkages of SEEA with the SDG

	SEEA-Agriculture, Forestry and Fisheries / SEEA-Experimental Ecosystem Accounting
	SEEA-Water / SEEA-physical supply and use tables for water/ SEEA-land accounts / SEEA- ecosystem accounts
	SEEA-Energy
	Material flow accounts / SEEA and tourism satellite accounts
	SEEA-emission accounts
	SEEA-land accounts / SEEA-environmental protection expenditure accounts / SEEA- emission accounts
	SEEA-material flow accounts, water accounts, energy accounts and other resource specific accounts / SEEA-solid waste accounts / SEEA and tourism satellite accounts
	SEEA-Agriculture, Forestry and Fisheries / SEEA-emissions accounts / SEEA-accounts for aquatic resources / SEEA-land accounts / SEEA-environmental taxes and subsidies accounts
	SEEA-land accounts / SEEA-Agriculture, Forestry and Fisheries / ecosystem accounts (ecosystem condition accounts, ecosystem service accounts and biodiversity accounts)

In addition, SDG 3 on Good Health and Wellbeing also shows linkage with SEEA, as all SEEA accounts promote good health and wellbeing. SDG 13 on Climate Change also shows linkage with SEEA and SDG.

Biodiversity

62. What is Biodiversity and why do we need to account for it?

The term biodiversity derived from "biological diversity" refers to the variety of life on Earth at all its levels, from genes to ecosystems. This includes diversity within species, between species and of ecosystems. Biodiversity includes all ecosystems— managed (plantations, farms, croplands, aquaculture sites, urban parks) and unmanaged (forest, nature preserves, or national parks) and represents the wealth of biological resources available to humankind. The biodiversity of any given region is not evenly distributed. It varies globally and within regions. The various factors that influence the biodiversity of a region include temperature, altitude, precipitation, soils and pressures from human activities.

According to the Convention on Biological Diversity (CBD), "Biological diversity[33]" means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of

[33] https://www.cbd.int/convention/articles/?a=cbd-02

which they are part; this includes diversity within species, between species and of ecosystems.

The accounting for biodiversity is needed with the aim of mainstreaming[34] the use of data on biodiversity in planning and decision making. The purpose of accounting for biodiversity includes informing conservation actions and the enhancement of biodiversity as an environmental management objective in its own right, as well as discussion about securing ecosystem services supply, and about various policy responses that may be relevant, such as biodiversity finance. Accounting for Biodiversity[35] recognizes the CBD definition of biodiversity, the different components of biodiversity, and the links between economic activity and changes in biodiversity.

63. What is the Shannon-Weiner Index of Biodiversity?

Species diversity is defined as the number of species and abundance of each species that live in a particular location. Species richness (number of different species) is a common way of measuring biodiversity. The Shannon-Weiner Index of biodiversity is a commonly used indicator for comparing diversity between various habitats. It quantifies the diversity of the species by measuring both species abundance and species richness. The Shannon-Wiener index is calculated by the following formula:

$$H' = -\Sigma\, p_i \, ln\, p_i$$

where p_i is the proportion of individuals found in species 'i'.

For a well-sampled community, this proportion can be estimated as $p_i = n_i/N$, where n_i is the number of individuals or the population of species' i 'and N is the total number of individuals or total population across species in the community. By definition, p_i will all be between zero and one, the natural log makes all the terms of the summation negative, which is why the inverse of the sum is taken.

The Shannon-Wiener Index assumes that all species are represented in a sample and that they are randomly sampled. A high value of H' would be a representative of a diverse and equally distributed community and lower values represent a less diverse community. A community with only one species would have an H' value of 0 because pi would equal 1 and be multiplied by ln pi which would equal zero. Values are generally between 1.5 and 3.5 in most ecological studies, and the index is rarely greater than 4. The Shannon index increases as both the richness and the evenness of the community increase.

64. What is IUCN?

The International Union for Conservation of Nature (IUCN) is an international organization to provide conservation to nature and natural resources in a

[34] https://seea.un.org/sites/seea.un.org/files/documents/EA/seea_ea_white_cover_final.pdf

[35]https://ec.europa.eu/environment/nature/biodiversity/economics/#:~:text=The%20Economics%20of%20Eceosystems%20and%20Biodiversity%20(TEEB)%20is%20a%20global,of%20ecosystem%20services%20and%20biodiversity

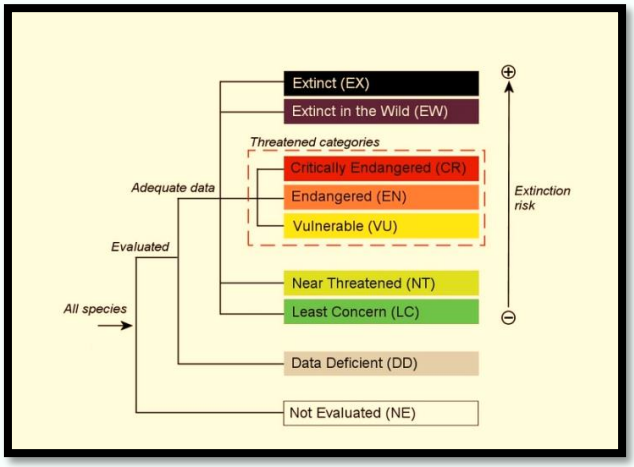
sustainable way[36]. IUCN was established in 1948. The working principle of IUCN depends on data gathering and analysis, research, field projects, advocacy as well as education. The objectives of IUCN include "influence, encourage and assist societies throughout the world to conserve nature and to ensure that any use of natural resources is equitable and ecologically sustainable". IUCN harnesses the knowledge, resources and reach of over 1500 Member organisations. These include States and Government agencies, NGOs large and small, Indigenous Peoples' organisations, scientific and academic institutions and business associations. Members from more than 160 countries are involved for the data documentation of IUCN.

65. What is IUCN Red List of Threatened Species?

The IUCN Red List of Threatened Species is the world's most comprehensive information source on the extinction risk of animals, fungi and plants. Assessors place species into one of the IUCN Red List Categories, based on a series of assessment criteria[37]. For each species, The IUCN Red List provides information about its range, population size, habitat and ecology, use and/or trade, threats and conservation actions.

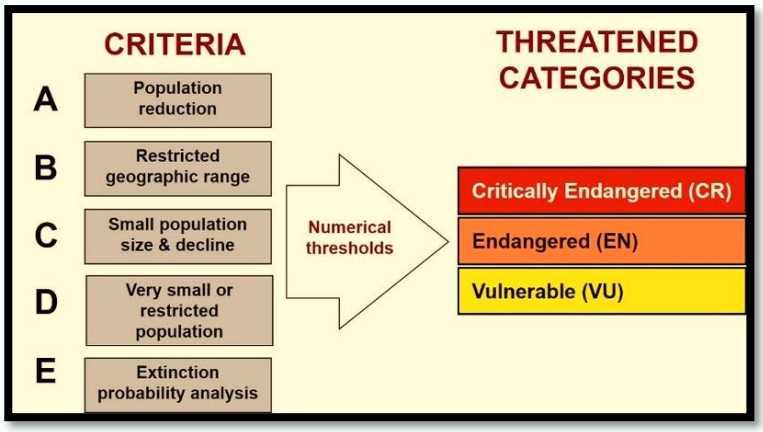
66. What are the IUCN Red List Categories and Criteria?

The IUCN Red List Categories indicate how close a species is to becoming extinct. The nine Red List Categories are shown below:



Species are assessed against five criteria (see below) based on geographic range, population size and population decline/increase, in addition to extinction probability analyses. These criteria determine which category is most appropriate for the species.

[36] https://www.iucn.org/about
[37] https://www.iucnredlist.org/about/background-history



Species in the 'Vulnerable', 'Endangered' and 'Critically Endangered' categories are collectively described as 'threatened'. The IUCN Red List does not include 'Not Evaluated' species. 'Critically Endangered' species may also be tagged as Possibly Extinct or Possibly Extinct in the Wild. For regional assessments, two additional categories are also available: 'Not Applicable' and 'Regionally Extinct'.

67. What are Protected Areas?

A Protected Area[38] is a geographical space, recognized, dedicated and managed through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values. The establishment of comprehensive, ecologically representative, effectively managed and financially secured protected area networks is a critical strategy not only for biodiversity conservation, but for securing ecosystem goods and services, enabling climate change adaptation and mitigation, and helping countries achieve the Sustainable Development Goals.

Protected Areas[39] are those in which human occupation or at least the exploitation of resources is limited. The definition that has been widely accepted across regional and global frameworks has been provided by the International Union for Conservation of Nature (IUCN) in its categorization guidelines for protected areas. There are several kinds of protected areas, which vary by level of protection depending on the enabling laws of each country or the regulations of the international organizations involved. The term "Protected Area" also includes Marine Protected Areas, the boundaries of which will include some area of ocean, and Transboundary Protected Areas that overlap multiple countries which remove the borders inside the area for conservation and economic purposes.

As per IUCN, there are 6 categories of Protected Area; Category Ia & Ib- Strict Nature Reserve and Wilderness Area, Category II- National Park, Category III- Natural Monument or Feature, Category IV- Habitat/Species Managed Area, Category V- Protected Landscape/ Seascape, Category VI-Protected area with sustainable use of natural resources. In India, Protected Areas are declared under

[38] https://www.cbd.int/undb/media/factsheets/undb-factsheet-pa-en.pdf
[39] http://www.wiienvis.nic.in/Database/Protected_Area_854.aspx

Wildlife (Protection) Act 1972 in four categories- National Parks, Wildlife Sanctuaries, Conservation Reserves and Community Reserves.

68. What is Convention on Biological Diversity?

The Convention on Biological Diversity (CBD) is a multilateral agreement of treaty. It was opened for signature on 5th June 1992 during the Earth Summit in Rio de Janeiro, Brazil, and entered into force on 29th December 1993. The prime goals of this convention include sustainability in conservational measures and benefit-sharing along with the development of the strategic plan for the conservational practices.

There are three main objectives of Convention on Biological Diversity (CBD).

(i) The conservation of biological diversity
(ii) The sustainable use of the components of biological diversity
(iii) The fair and equitable sharing of the benefits arising out of the utilization of genetic resources

69. What is CITES and its Appendix?

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is a global agreement or multilateral treaty among governments to regulate or ban international trade in species under threat to protect endangered plants and animals. It was adopted by International Union for Conservation of Nature (IUCN) in 1963 and signed in 1973 whereas it came into effect on 1st July 1975. CITES represents three appendices as Appendices I, II, and III to protect the floral and faunal communities against over-exploitation[40].

Appendix I includes animals and plants which are threatened with extinction. CITES prohibits international trade in specimens of these species except in exceptional circumstances like when the purpose of trade is not commercial and for scientific research through import and export permit.

Appendix II lists species that are not necessarily now threatened with extinction but that may become so unless trade is closely controlled. The species whose specimens in trade look like those of species listed for conservation reasons. International trade in specimens of Appendix-II species may be authorized by the granting of an export permit or re-export certificate.
Appendix III contains species that are protected in at least one country, which has asked other CITES Parties for assistance in controlling the trade. International trade in specimens of species listed in this Appendix is allowed only on presentation of the appropriate permits or certificates.

[40] https://cites.org/eng/disc/what.php

Crop and Soil

70. What is Soil Nutrient Index?

In order to compare the levels of soil fertility of one area with those of another it is necessary to obtain a single value for each nutrient. The nutrient index (N.I.) value is a measure of the nutrient supplying capacity of soil to plants[41]. This index is used to evaluate the fertility status of soils based on the samples in each of the three classes, i.e., low, medium and high. The classes are constructed based on some threshold values for each nutrient. Indian Council of Agricultural Research (ICAR), Ministry of Agriculture and Farmer's Welfare have developed a formula for evaluating the soil nutrient index which is given below:

$$Nutrient\ Index\ (N.I.) = \frac{(N_L \times 1 + N_M \times 2 + N_H \times 3)}{N_T}$$

where N_L : Indicates the number of samples falling in the low class of nutrient status

N_M : Indicates the number of samples falling in the medium class of nutrient status

N_H : Indicates the number of samples falling in the high class of nutrient status

N_T : Indicates the total number of samples analyzed for a given area.

If the value of N.I. comes out to be less than 1.67, it indicates that the fertility status of the soil is low in the area, if N.I. is between 1.67 to 2.33, then it is indicative of the fact that the fertility status is medium and if the value of N.I. is greater than 2.33, it denotes high soil fertility of the area for a particular nutrient.

71. What is Soil Erosion Prevention Service provided by the Croplands?

Soil erosion control/prevention services are ecosystem contributions, particularly the stabilizing effects of vegetation, that reduce the loss of soil (and sediment) and support the use of the environment (e.g., agricultural activity, water supply). This has been estimated by computing the difference between the current estimates of loss of soil and the probable loss of soil due to erosion in case the cropland did not exist.

The empirical soil loss model Revised Universal Soil Loss Equation (RUSLE) has been used to get the estimates of Soil Erosion in the Croplands. RUSLE and its components are as follows:

$$A = R * K * L * S * C * P$$

Where

A= Mean annual soil loss (metric tons/ ha/ year)

R= Rainfall erosivity factor (megajoules millimeter hectare / hour/ year)

[41] Singh, G., Sharma, M., Manan, J., & Singh, G. (2016). Assessment of soil fertility status under different cropping sequences in District Kapurthala. J Krishi vigyan, 5(1), 1-9.

K=Soil erodibility factor (metric tons hectare hour hectare/ megajoules/millimeter)
L= Slope-length factor (unit less)
S= Slope-steepness factor (unit less)
C= Cover and management factor (unit less)
P= Support practice factor (unit less)

72. What is SEEA-Agriculture, Forest and Forestry Framework?

The System of Environmental-Economic Accounting for Agriculture, Forestry and Fisheries integrates information on the environment and economic activities of agriculture, forestry and fisheries using the structures and principles laid out in the SEEA-CF. These activities depend directly on, as well as have an impact upon, the environment and its resources. Integrating information about agriculture, forestry and fisheries facilitate understanding of the trade-offs and dependencies between these activities and their related environmental factors. Understanding this complex relationship is critical for the analysis of sustainable food and agriculture.

The accounts in SEEA Agriculture, Forestry and Fisheries are most commonly compiled at the level of the individual product and use two main types of accounts to capture relevant agriculture, forestry and fisheries information.

(i) Flow Accounts: In physical terms, these accounts record physical flows of agriculture, forestry and fishery products between the environment and the economy. Parallel monetary accounts then record the monetary flows associated with agriculture, forestry and fishery transactions for products.

(ii) Asset Accounts: These accounts measure the quantity of agriculture, forestry and fishery resources and changes in these resources over an accounting period. These accounts can be compiled in physical terms, which provide important information on the stock of environmental assets. Also, parallel monetary accounts then record the monetary flows associated with transactions for the agriculture, fishery or forestry products.

73. What are Cropland Fragmentation, Crop Diversification and Crop Intensification?

Cropland Fragmentation: Cropland Fragmentation refers to the reduction in the size of the landholding due to distribution of land among inheritors or due to other reasons.

Crop Diversification: Crop diversification is used to refer to the practice of cultivating more than one variety of crop either of the same species or different species in a given area. It is one of the cost-effective ways to reduce ambiguities in

agriculture and provides an insurance or a buffer against environmental fluctuations as each species respond differently to changes.
Crop Intensification: Crop intensification informs about the number of crops a farmer grows in a given agricultural year on the same field and is another means for intensification of production from the same plot of land. It is measured as the ratio of Total Cropped Area to Net Area Sown.

74. What is Soil Erosion Prevention Service provided by the Forests?

Soil erosion control/prevention services are ecosystem contributions, particularly the stabilizing effects of vegetation, that reduce the loss of soil (and sediment) and support the use of the environment (e.g., agricultural activity, water supply). Soil Erosion prevention services by Forests has been estimated by computing the difference between the current estimates of loss of soil and the probable loss of soil due to erosion in case the Forests did not exist and the land would have been bare. The empirical soil loss model Revised Universal Soil Loss Equation (RUSLE) has been used to get the estimates of Soil Erosion in the Forests.

75. What is Crop Provisioning Service?

Crop Provisioning Services are the services provided by the croplands for generation of the food and non-food crops. The ecosystem service, "crop provisioning service" is the total and combined result of processes taking place in croplands, that support crop production such as infiltration of water, water holding capacity of the soil, the absorption of plant nutrients by soil particles and the resupply of these particles to plants.

In other words, Crop Provisioning[42] Services are the ecosystem contributions to the growth of cultivated plants that are harvested by economic units for various uses including food and fiber production, fodder and energy. This is a final ecosystem service.

In SEEA, the 'Resource Rent Method' or 'Rental Price Method' have been prescribed for the valuation of the crop provisioning services. This service falls under Ecosystem Provisioning Services (Refer Q. 20).

76. What is Carbon Retention Service?

Carbon dioxide is the most commonly produced Greenhouse Gas (GHG). Carbon retention is the process of capturing and storing atmospheric carbon dioxide. It is one method of reducing the amount of carbon dioxide in the atmosphere with the goal of reducing global climate change. Carbon retention services provided by the ecosystems services are the ecosystem contributions to reducing concentrations of GHG in the atmosphere through the removal (sequestration) of carbon from the

[42] https://seea.un.org/sites/seea.un.org/files/5._adoption_of_seea_ea_as_an_international_standard.pdf

atmosphere and the retention (storage) of carbon in ecosystems. In other words, it is defined as the estimates of annual service flow derived from the carbon stocks using a suitable rate of return. Carbon Retention Service falls under Regulating Services of Ecosystems (Refer Q. 20).

Forest

77. What is a Forest asset ?

In forest accounting, a forest asset represents a stock of forest land and associated biological resources that generates a flow of benefits over time. Forest assets include:

- forest land (area under forest),
- standing timber and growing stock,
- forest biomass and carbon stock, and
- the capacity of forests to provide ecosystem services.

Forest assets are treated as natural capital assets, meaning they are capable of producing economic value repeatedly without being manufactured. In the accounting framework, forest assets are recorded at the beginning and end of an accounting period, and changes are tracked due to afforestation, deforestation, degradation, regeneration, and natural growth.[43]

78. What is a Recorded Forest Area (RFA)?

Recorded Forest Area [44]refers to land that has been legally notified or recorded as forest under government statutes and administrative records. RFA is a legal and administrative concept and does not necessarily indicate the presence of tree cover.

It includes reserved forests, protected forests and other notified forest lands. RFA is important for understanding forest governance, ownership and management responsibilities.

79. What is a Forest cover?

Forest cover refers to land with a minimum tree canopy density of 10 % and an area of at least one hectare, irrespective of legal status or ownership.

Unlike Recorded Forest Area, forest cover is a biophysical concept derived from remote sensing and reflects the actual presence of tree vegetation on the ground.[45]

[43] 1) https://www.mospi.gov.in/web/mospi/environmental-accounting 2) https://seea.un.org/content/seea-central-framework

[44] https://fsi.nic.in/forest-report

[45] https://fsi.nic.in/forest-cover

80. What are the Classes of Forest Cover ?

Forest cover is classified based on canopy density to assess forest condition and quality:

Very dense Forest	All Lands with tree cover (Including mangrove cover) of canopy density of 70% and above
Moderately Dense forest	All lands with tree cover (Including mangrove cover) of canopy density between 40% and 70% above
Open forest	All lands with tree cover (Including mangrove cover) of canopy density between 10% and 40%
Scurb	All forest lands with poor tree growth mainly of small or stunted trees having canopy density less than 10 percent
Non Forest	Any area not included in the above classes

This classification supports monitoring of forest degradation and improvement.[46]

81. What is tree cover?

Tree cover comprises all tree patches outside the forest area, which are less than one hectare in extent including all the scattered trees found in the rural and urban settings, and not captured under the forest cover assessment.

82. What is a Forest Condition Account?

A forest condition account provides information on the health, quality and functioning of forests over time. It complements forest extent accounts by tracking indicators such as growing stock, biomass, carbon stock, fragmentation, regeneration status and invasive species.

Condition accounts help assess whether forests are improving or degrading and how well they can continue to provide ecosystem services.[47]

83. What is Forest Carbon Stock?

Forest carbon stock[48] is the total amount of carbon stored within forest ecosystems. It includes carbon stored in living biomass, deadwood, litter and soil.

Forest carbon stocks play a crucial role in climate change mitigation by absorbing and storing atmospheric carbon dioxide.

84. What is Forest Fragmentation?

[46] https://fsi.nic.in/scheme-of-classification

[47] https://seea.un.org/ecosystem-accounting

[48] 1) https://www.ipcc-nggip.iges.or.jp 2) https://www.fao.org/climate-change/forest-carbon

Forest fragmentation[49] occurs when large forest areas are divided into smaller, isolated patches. Fragmentation reduces habitat connectivity, increases edge effects and negatively affects biodiversity and ecosystem services.

85. What is Forest Regeneration?

Forest regeneration refers to the natural or artificial renewal of forest vegetation following a disturbance such as harvesting, fire, storms, pests or other natural and human-induced impacts. Regeneration occurs through biological processes including seed germination, sprouting (coppicing) from existing trees, or planting and assisted regeneration carried out through human intervention.

Natural regeneration takes place when forests recover on their own through seeds, root suckers or coppice growth, whereas artificial regeneration involves deliberate activities such as planting or seeding to re-establish forest cover. Both forms of regeneration are essential components of sustainable forest management.

Forest regeneration is widely recognised as a key indicator of forest sustainability and resilience, as it reflects the ability of forests to maintain their structure, productivity and ecological functions over time. Effective regeneration ensures the continuity of forest ecosystems and their capacity to provide timber, non-timber forest products, carbon sequestration, biodiversity habitat and other ecosystem services.

86. What are Forest Ecosystem Services?

Forest ecosystem services [50]are the benefits that people obtain from forests as a result of ecological processes and functions. These services represent the flows generated by forest ecosystems and explain how forests contribute to human well-being, economic activity and environmental stability.

Forest ecosystem services are generally classified into three broad categories:

1. **Provisioning services**, which include material goods obtained from forests such as timber, fuelwood, bamboo, fodder, fruits, medicinal plants and other non-timber forest products. These services directly support livelihoods and supply raw materials to the economy.

2. **Regulating services**, which arise from the ability of forests to regulate natural processes. These include carbon sequestration and storage, climate regulation, water regulation, flood control, soil erosion prevention and improvement of air quality. Regulating services play a critical role in climate change mitigation and environmental resilience.

3. **Cultural services**, which are non-material benefits derived from forests, such as recreation, ecotourism, spiritual and religious values, education, cultural

[49] https://www.fao.org/forestry
[50] https://seea.un.org/ecosystem-accounting

heritage and aesthetic enjoyment. Although these services are often not traded in markets, they are essential for social well-being and cultural identity.

In forest accounting, ecosystem services form the link between forest condition and economic value. The capacity of forests to provide ecosystem services depends on their extent, health and ecological quality. By systematically recording ecosystem services, forest accounts help make visible the wide range of benefits provided by forests, many of which are not captured in conventional economic statistics. This information supports informed decision-making for forest conservation, sustainable resource management and climate action.

87. What is Timber and Non-Timber Forest Products (NTFP) Provisioning Service?

Forests provide direct and indirect goods and services to human well-being. Provisioning services provided by forests are the forest goods and services obtained from forest ecosystems. Timber provisioning services are the contribution of the Forest Ecosystem to the supply and use of forestry products (excluding the Non-Wood Forest Products).

As the term Non-Timber Forest Product (NTFP) specifies, these products are not timber and come from forests. NTFP provisioning services are defined as the provisioning service for products other than timber that are produced in forests. NTFPs comprise a large number of wild-growing forest materials such as bamboo, fodder, lac, sandalwood, honey, resin, gum, tendu leaves, cork, balsams, eelgrass, acorns, horse chestnuts, mosses, lichens, etc. NTFPs include plants used for food, beverages, forage, fuel, medicine, fibers and biochemicals; animals, birds and fish for food, fur and feathers; as well as their products such as honey, lac and silk. Another term, Non-wood Forest Products differs from the NTFP in that it excludes all wood (including fuelwood) while NTFP includes wood for uses other than for timber. Non-biotic products that may come from the forest, such as rocks and minerals, are not classified as NTFPs. These services fall under Ecosystem Provisioning Services (Refer Q. 20).

88. What is Gross Value of Output (GVO) in Forest Accounts?

Gross Value of Output represents the total annual value of goods and ecosystem services produced by forests, before deducting costs. GVO combines market outputs and selected non-market ecosystem services.

Mineral and Energy

89. What are Mineral and Energy Accounts?

Mineral and Energy Accounts are structured compilation of information on flows of Minerals and Energy and its relation with economy and the environment. Mineral and conventional energy resources are a unique type of environmental

asset in that they can be extracted and used in economic activity but cannot be renewed on any human timescale. Since they cannot be renewed, there is particular interest in understanding the rate at which these assets are extracted and depleted, the overall availability of these assets, and the sustainability of the industries that exploit them. These accounts are based on SEEA framework[51,52], which is an accounting approach that records, as completely as possible, the stocks and flows of mineral and energy in the territory of reference.

Asset accounts for mineral and energy resources organize relevant information, including the quantities and values of stocks of the resources and the changes in these over the accounting periods. These accounts can be compiled in physical terms, which provide valuable information about energy resource availability. They can also be compiled in monetary terms to show the contribution and depletion of the natural capital of energy resources. A basic physical asset account for mineral and energy resources is compiled by Type of resources, each with the same unit of measurement and by class of resources. The structure of Asset Account for mineral and energy resources is as follows:

	Volume of mineral and energy resources (by resource, by class)
Opening Stock	
Additions to stock	
Discoveries	
Upward reappraisals	
Reclassifications	
Total additions to the stock	
Reductions in the stock	
Extractions	
Catastrophic Losses	
Downward reappraisals	
Reclassifications	
Total reductions in the stock	
Closing stock	

Flows of extraction, depletion and discoveries are central to the asset account and these, in turn, can provide valuable information regarding the availability of individual resources.

90. What is SEEA-Energy Framework?

The SEEA-Energy is a multi-purpose conceptual framework for organizing energy-related statistics. It supports analysis of the role of energy within the economy, the state of energy inputs and various energy-related transactions of environmental interest. It is fully consistent with the SEEA Central Framework. Energy

[51] https://seea.un.org/content/seea-central-framework, https://seea.un.org/seea-energy
[52] https://seea.un.org/seea-energy

information is typically presented in physical terms, but the SEEA-Energy also applies monetary valuations to various stocks and flows, based on the SEEA accounting approach. Besides Asset Account, the other main type of account that captures relevant energy information in a systematic way is Flow Accounts. Energy flow accounts measure both the supply and use of energy, identifying the energy products and which part of the economy produces or uses them.

In physical terms, these accounts record physical flows of energy between the environment and the economy. Physical flows are recorded in joules to provide a common unit to aggregate across energy sources. Parallel monetary accounts then record the monetary flows associated with energy-related transactions for energy products.

a. Physical supply and use tables: The physical supply and use tables (PSUT) provide a structure for compiling and presenting all energy flows that enter, are used within and leave the national economy of a given country for a period of time.
b. Monetary supply and use tables: Monetary supply and use tables in SEEA fully articulate in monetary terms the flows of energy products in an economy between different economic units.

91. What are the different categories of mineral and energy resources?

The known deposits of mineral and energy resources are categorized into three classes, based on the criteria from the United Nations Framework Classification (UNFC)-2009 as follows:

(i) Class A: Commercially Recoverable Resources which includes production projects, projects approved for development and projects justified for development.
(ii) Class B: Potentially Commercially Recoverable Resources which includes economic and marginal development projects pending and development projects on hold.
(iii) Class C: Non-commercial and Other Known Deposits which includes unclarified development projects, non-viable development projects and additional quantities in place.

Known deposits exclude potential deposits where there is no expectation of the deposits becoming economically viable and there is a lack of information to determine the feasibility of extraction or to have confidence in the geological knowledge.

92. What are Inferred, Indicated and Proved Mineral Resources?

Inferred Mineral Resource: The part of a Mineral Resource for which tonnage, grade and mineral content can be estimated with a low level of confidence. It is inferred from geological evidence and assumed but not verified geological and/or grade continuity.

Indicated Mineral Resource: For this category, tonnage, density, shape, physical characteristics grade and mineral content can be estimated with reasonable level of confidence based on exploration, sampling and testing information, location of borehole, pits, etc.

Proved Mineral Reserves: Proved mineral reserves are economically mineable part of Measured Mineral Resource. It has a higher level of confidence than that of an Indicated Mineral Resource or an Inferred Mineral Resource.

The Coal resources of India, based on the results of Regional/Promotional Exploration, where the boreholes are normally placed 1-2 Km apart, are classified into 'Indicated' or 'Inferred' category. On subsequent detailed exploration where boreholes are less than 400 meter apart, the resources are classified into 'Proved/Measured' category[53].

It may be noted here that only the economically mineable occurrences were termed as Reserves while the rest were considered as Resources.

93. What are various types of additions in the stock of minerals - energy assets ?

According to SEEA-Energy, there are 3 types of **additions**[54] to the stock of the Mineral assets & Energy Assets:

• *Discoveries*: Discoveries should incorporate estimates of the quantity of new deposits found during an accounting period. To be regarded as a discovery the new deposit must be a known deposit – i.e. in Class A, B or C. In situations, where a quantity of potential deposits becomes known to a higher degree of confidence, this increase should be treated as discoveries. Discoveries should be recorded by type of resource and by category of resource.

• *Upward reappraisals*: Reappraisals should only pertain to known deposits. They will relate to additions in the estimated available stock of a specific deposit, or to changes in the categorization of specific deposits between Class A, B or C based on changes in geological information, technology, resource price or a combination of these factors.

• *Reclassifications*: Reclassifications may occur if certain deposits are opened or closed to mining operations due to a government decision concerning the access rights to a deposit. All other changes in the quantity of known deposits should be treated as reappraisals. Reclassifications may conceivably be recorded if asset accounts for energy resources are being compiled by institutional sector.

94. What are various types of reductions in the stock of minerals - energy assets ?

There are four types of **reductions** in the stock of mineral assets & energy assets:

[53] https://coal.gov.in/en/major-statistics/coal-reserves
[54] https://seea.un.org/sites/seea.un.org/files/documents/seea-energy_final_web.pdf

• *Extraction*: Estimates of extraction should reflect the quantity of the resource physically removed from the deposit. It should exclude mining overburden, i.e. the quantity of soil and other material moved in order to extract the resource. The quantity should also be estimated before any refinement or processing of the resource is undertaken. Estimates of extraction should include estimates of illegal extraction, either by residents or non-residents, as these amounts reduce the availability of the resource.

• *Catastrophic losses*: Catastrophic losses are rare for most energy resources. Flooding and collapsing of mines do occur but the deposits continue to exist and can, in principle, be recovered. For example- oil wells that can be destroyed by fire or become unstable for other reasons leading to significant losses of oil resources. Losses of oil and related resources in this situation should be treated as catastrophic losses.

• *Downward reappraisals*: Reappraisals should only pertain to known deposits. They will relate to reductions in the estimated available stock of a specific deposit, or to changes in the categorization of specific deposits between Class A, B or C based on changes in geological information, technology, resource price or a combination of these factors.

• *Reclassifications*: Reclassifications may occur if certain deposits are opened or closed to mining operations due to a government decision concerning the access rights to a deposit. All other changes in the quantity of known deposits should be treated as reappraisals. Reclassifications may conceivably be recorded if asset accounts for energy resources are being compiled by institutional sector.

95. What is sterilization loss and extraction loss in context of Minerals?

The sterilization of mineral resources is understood as a lack or loss of the possibility of their future extraction or exploitation. During the exploitation of mineral deposits, some parts of their resources become sterilized as inaccessible because of natural hazards or unfavourable economic conditions[55]. For example, according to a report of the Expert Committee on Road Map for Coal Sector Reforms under the chairmanship of Shri T.L. Sankar[56], released in December 2005 by Ministry of Coal, GoI, a ratio of 1:4.7 is approximately suggested to know the proportion of the coal extracted and coal sterilized during the extraction process (1 unit of Coal extraction involves 3.7 units of sterilization loss).

96. For which resources the Asset Account for Energy is compiled?

The asset accounts in SEEA-Energy are compiled only for minerals and energy resources[57]. These accounts provide valuable information to assess the fact whether the current patterns of economic activity are depleting and/or degrading

[55] https://www.mdpi.com/2079-9276/10/4/30
[56] http://www.indiaenvironmentportal.org.in/files/expertreport-1.pdf
[57] https://seea.un.org/seea-energy

the available mineral and energy resources. In addition, the information on the asset accounts can help in the management of mineral and energy resources. In the context of India, asset accounts for Energy has been compiled for Coal, Lignite, Petroleum and Natural Gas. The accounts could not be compiled for Nuclear Fuels due to confidentiality of sensitive information.

97. What are differences between Energy Statistics and Energy Accounts?

Energy data are generally collected independently across different commodities, such as oil, natural gas or coal. The Energy related data are scattered across multiple Ministries/Departments and other stakeholders. Energy Statistics presents an integrated database presenting a wide portfolio of data on reserves, capacity, production, trade, consumption of energy resources and energy efficiency ratios.

Energy Accounts on the other hand, uses energy statistics across sectors and bring them together in accounting format that supports analysis of the role of energy within the economy, the state of energy inputs and various energy-related transactions of environmental interest. Two main types of accounts viz. Asset Accounts and Flow Account, capture relevant energy information in a systematic way.

Energy statistics are often developed to address specific policy questions and issues, and energy accounts merge a wide range of energy related statistics across sectors into one consistent framework. Energy statistics are usually based on the territory principle, which assigns flows to the country in which the producing or consuming unit is located at the time of the flow. Energy Accounts follows Residence principle which assigns flows of energy to the country of residence of the producing or consuming unit.

98. What is Energy Balance?

An energy balance is a framework to compile data on all energy products entering, existing and used within a given country during a reference period (e.g., a year). It expresses all data in common energy units, which makes it possible to define a "total" product. The purpose of compiling an energy balance starting from the various commodity balances are numerous; they are to:

- Provide a comprehensive overview of the energy profile of a country, to monitor energy security, energy markets, relevant policy goals and to formulate adequate energy policies;
- Provide the basis for aggregate socio-economic indicators, as well as for estimates of CO_2 emissions;
- Compare data of different reference periods and different countries;
- Provide a tool to ensure completeness, consistency and comparability of basic statistics;

- Calculate efficiencies of transformation processes, as well as relative shares of different sectors or products in the country's total supply or consumption

An energy balance generally takes the form of a matrix of products and flows, with varying levels of disaggregation, although graphical formats also exist (e.g. Sankey diagram).

Two major components of the energy balance statistics are Total Primary Energy Supply (TPES) and Total Final Consumption (TFC) of energy commodity. Within a balance, the total final consumption is disaggregated into sectors, like industry, transport, residential, services and others. However, the level of disaggregation of such energy data is not enough to monitor energy efficiency, as no information is available, for example on the residential or services end uses, nor on the transport vehicle types or segments. The energy balance will therefore be useful to assess the largest consuming sectors within a country where the energy saving potential will have more impact, before starting more detailed collection programme on data for energy efficiency indicators[58].

99. What is International Recommendations for Energy Statistics (IRES) framework?

The United Nations Statistical Commission, at its forty-second session held in New York, 22 to 25 February 2011, adopted the International Recommendations for Energy Statistics (IRES).

The International Recommendations for Energy Statistics provide data compilers with a complete set of recommendations covering all aspects of the statistical production process, from basic concepts, definitions and classifications to data sources, data compilation strategies, energy balances, data quality and statistical dissemination.

IRES was prepared by UNSD in close cooperation with the Oslo Group on Energy Statistics and the Inter-secretariat Working Group on Energy Statistics (InterEnerStat). Consultations with specific groups of experts took place during the preparation process, such as the Committee of Experts on Environmental-Economic Accounting, the Expert Group on International Economic and Social Classifications and the London Group on Environmental Accounting.

With the adoption of IRES by the United Nations Statistical Commission, UNSD prepared the Energy Statistics Compilers Manual (ESCM)[59], which contains further and more detailed explanations of the recommendations and provide practical guidance for compilers of energy statistics, balances and accounts.

[58] Energy Statistics 2022, MoSPI

[59] https://unstats.un.org/unsd/energy/ESCM_Whitecover_170323.pdf

100. What are some of the indicators that can be derived from Energy Accounts?

SEEA Energy Accounts can provide some important indicators linked to the social, economic and environmental dimensions. For example,[60]

Energy use per capita- It is calculated as 'Energy use' (total primary energy supply, total final consumption and electricity use) divided by 'Total population' and it shows how much energy is being used in a given country or area. Energy use can be derived from the physical supply-use table.

Energy use per unit of GDP- Calculated as 'Energy use' (total primary energy supply, total final consumption and electricity use) divided by GDP of the country. Energy consumption per GDP, called energy intensity, is a way to measure the energy consumed per unit of GDP. It emphasizes the efficiency of energy use and is recognized as the reciprocal of energy efficiency[61].

Industrial energy intensities- It shows Energy use in industrial sector and by manufacturing branch by their corresponding value added. Energy intensity is defined as the amount of energy used to produce a given level of output or activity. Using less energy to produce a product or provide a service results in reduced energy intensity.

Non-carbon energy share in energy and electricity- The components of this indicator are 'Primary supply, electricity generation and generating capacity by non-carbon energy' and 'Total primary energy supply, total electricity generation and total generating capacity'. The main non-carbon sources of energy are renewable energy resources.

Ocean

101. What is Blue Carbon?

Blue carbon is the carbon stored in coastal and marine ecosystems. Coastal ecosystems such as mangroves, tidal marshes and seagrass meadows sequester and store more carbon per unit area than terrestrial forests and are now being recognised for their role in mitigating climate change[62].

102. What are Ocean Ecosystem Accounts?

[60] SEEA Energy
[61] https://link.springer.com/referenceworkentry/10.1007/978-94-007-0753-5_874
[62] https://iucn.org/resources/issues-brief/blue-carbon

An Ocean Ecosystem Account is a structured compilation of consistent and comparable information – maps, data, statistics and indicators – concerning marine and coastal environments, including related social circumstances and economic activity[63].

The general purpose of such accounts is to inform and enable public policy decision-making about oceans, and related analysis and research. The function of these accounts is to provide coherent structures for standardizing often fragmented data to produce reliable integrated indicators of interest to policy.

Ocean Ecosystem Accounting can (a) help in understanding the role of oceans and coasts in the economy, (b) serve as a mechanism to monitor the investment and net returns from ocean activities, (c) serve as a tool to understand how external events such as storms, climate change and environmental changes can impact Blue Economy development, and (d) help in identification of new areas for investment and innovation.

Ocean accounts can answer the following questions:

- What is the status of ocean wealth including produced assets (e.g. ports) and non-produced assets (e.g. coral reefs, mangroves, fish stocks)? What are the implications of external stresses (e.g., climate change) on ocean wealth?
- How are different groups of people benefitting from the ocean, ocean economy? (income or welfare)

103. What are the advantages of Ocean Accounts?

Ocean Accounts offer several significant advantages:

1. **Informed Public Policy**: Ocean Accounts help inform policies related to ocean management, climate change, and sustainable economic development by providing consistent, reliable, and integrated data on the status of ocean ecosystems and the economy. This data is crucial for making evidence-based decisions.
2. **Standardization of Fragmented Data**: Ocean Accounts bring together fragmented data from various sources, such as environmental assessments, economic activity, and social conditions, and present them in a structured, comparable format, allowing for better decision-making across sectors that impact oceans.
3. **Support for Achieving SDG 14**: Ocean Accounts align directly with SDG Goal 14 ("Life Below Water"), which aims to conserve and sustainably use the oceans and marine resources. By tracking and valuing marine resources and their contributions to society, Ocean Accounts provide a framework for monitoring progress towards SDG 14.

[63] https://unstats.un.org/unsd/statcom/51st-session/documents/BG-item-3h-TG_Ocean%20accounting_ESCAP-E.pdf

4. **Tracking Environmental and Economic Interactions**: By using the System of National Accounts (SNA) and SEEA principles, Ocean Accounts describe the interaction between the economy and the environment, tracking both the stocks (natural capital) and flows (services like fish production, carbon sequestration). These accounts also highlight social and governance factors affecting ocean health.

104. What is Blue Economy?

The Blue Economy is defined as an economy that comprises a range of economic sectors and related policies that together determine whether the use of ocean resources is sustainable[64]. An important challenge of the blue economy is to understand and better manage the many aspects of oceanic sustainability, ranging from sustainable fisheries to ecosystem health to preventing pollution.

105. What is the Blue Economy initiative?

The Blue Economy initiative in India seeks to unlock the full potential of ocean resources, with a particular emphasis on creating a national framework for the governance and management of these resources. As part of India's Vision for a New India by 2030, outlined in 2019, the Blue Economy[65] is recognized as a key pillar for economic growth.

In 2020, India introduced the Draft Policy Framework on the Blue Economy[65], which highlights seven priority focus areas:

1. **Sustainable Ocean Governance**: Establishing a strong framework for managing ocean resources, including national accounting systems for Blue Economy activities.
2. **Marine Spatial Planning**: Implementing integrated strategies to ensure the sustainable use of ocean resources.
3. **Ocean-Based Renewable Energy**: Tapping into renewable energy sources such as wind and tidal energy from the ocean.
4. **Marine Research and Development**: Promoting innovation in marine technologies to enhance ocean-based industries.
5. **Fisheries and Aquaculture**: Strengthening sustainable fisheries practices and supporting coastal livelihoods.

106. What are the crucial marine ecosystems?

Some Important marine ecosystems are mangroves, coral reefs, seagrass, estuaries, lagoon, sandy coast, coastal ocean water, mudflats. These marine

[64] https://www.un.org/regularprocess/sites/www.un.org.regularprocess/files/rok_part_2.pdf
[65] https://incois.gov.in/documents/Blue_Economy_policy.pdf

sub-ecosystems are the most diverse aquatic ecosystem on Earth and cover large areas. Monitoring the extent and condition of these ecosystem are vital for their plethora of contribution in benefits to society and economy.

107. Define Ocean Services and its categories?

As per SEEA-EA framework[66], ecosystem services are the contributions of ecosystems to the benefits that are used in economic and other human activity. Ecosystem Services can be broadly categorized into three categories as mentioned in point 15 above.

Some of the critical services that ocean ecosystem provides to both the environment and humankind include:

1. **Climate Regulation**: The ocean produces approximately half of the Earth's oxygen and absorbs more than 90% of the heat from greenhouse gas emissions. This role in climate regulation helps stabilize global temperatures and reduce the effects of climate change.
2. **Carbon Sequestration**: Oceans act as one of the largest carbon reservoirs on Earth. Coastal wetlands, mangroves, and seagrasses capture and store carbon in their leaves, stems, and soils, significantly contributing to climate change mitigation.
3. **Natural Disaster Protection**: Marine and coastal ecosystems (e.g., mangroves, coral reefs, wetlands) serve as a first line of defence against natural disasters like hurricanes, coastal erosion, and saltwater inundation, reducing the damage to human settlements and infrastructure.
4. **Food and Raw Materials**: Oceans provide essential food sources like fish, seafood, and seaweed, which are crucial for global food security. Marine resources also provide non-living resources like oil, gas, and minerals.
5. **Biodiversity**: Oceans are among the richest sources of biodiversity, with marine ecosystems supporting countless species that are important for food webs, medicinal research, and ecological balance.
6. **Economic Livelihoods**: Oceans provide economic benefits through fisheries, tourism, and shipping, supporting billions of people globally. Coastal areas are home to millions who depend on these resources for their livelihoods.

108. What are Ocean Assets and its accounts?

SEEA EA defines ecosystem assets as contiguous spaces of a specific ecosystem type characterized by a distinct set of biotic and abiotic components and their interactions[67]. Ocean Ecosystem Asset Accounts

[66] https://seea.un.org/sites/seea.un.org/files/documents/EA/seea_ea_white_cover_final.pdf
[67] Paragraph 2.11 of SEEA Ecosystem Accounting (SEEA EA), 2021 (https://seea.un.org/sites/seea.un.org/files/documents/EA/seea_ea_white_cover_final.pdf)

record the stocks and flows of biotic and abiotic natural assets related to oceans. Ocean ecosystem assets are recorded in a combination of accounts for individual environmental assets (minerals, energy and aquatic resources, e.g., fish stocks) from the SEEA CF and for ecosystem assets (such as wetlands, coral reefs) from the SEEA EA.

109. How are the Ocean Accounts linked to SDGs?

Ocean Accounts are directly aligned with SDG Goal 14 ("Life Below Water") and contribute to other related SDGs, such as SDG 13 (Climate Action) and SDG 2 (Zero Hunger) by providing a data framework to monitor and manage the health of the oceans and marine resources. Ocean Accounts contribute to some of the SDG targets in the following ways:

1. Target 14.1 (Reduce Marine Pollution): Ocean Accounts can track the levels of pollutants in marine environments, offering essential data for addressing marine pollution.
2. Target 14.2 (Protect and Restore Ecosystems): Ocean Accounts monitor the condition of marine ecosystems, such as coral reefs and mangroves, helping measure progress towards their conservation and restoration.
3. Target 14.4 (Sustainable Fishing): By monitoring fish stocks, Ocean Accounts enable better management of fisheries, ensuring sustainable harvesting practices and preventing overfishing.
4. Target 14.7 (Sustainable Use of Ocean Resources): Ocean Accounts track the economic use of marine resources, facilitating sustainable economic activities such as fishing, shipping, and tourism.

110. What is Marine Spatial Planning?

Marine Spatial Planning (MSP) is a public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic and social objectives that have been specified through a political process. MSP is not an end in itself but a practical way to create and establish a more rational use of marine space and the interactions among its uses, to balance demands for development with the need to protect the environment, and to deliver social and economic outcomes in an open and planned way. MSP is the comprehensive knowledge process that formulates coordinated policies for the sustainable utilization of marine resources in energy, industry, ports & harbours, environment, fisheries, tourism etc for economic development[68].

[68] https://nccr.gov.in/sites/default/files/msp.pdf

111. What is the Coastal Regulation Notification 2019?

The Coastal Regulation Zone (CRZ) Notification, 2019, promulgated under Environment (Protection) Act 1986, has specific focus on conservation and management plans of Ecologically Sensitive Areas (ESAs), like Mangroves, Sea grasses, Sand dunes, Corals and Coral reefs, Biologically active mudflats, Turtle nesting grounds, and Horseshoe crabs' habitats[69]. The 2019 notification strengthens the protection of sensitive coastal areas and aligns with the sustainable use principles of the Blue Economy and Ocean Accounts.

112. What is GOAP?

The Global Ocean Accounts Partnership (GOAP) is a global, multi-stakeholder partnership created to help countries and other parties move beyond GDP in measuring and managing progress toward the sustainable development of the ocean[70]. India is a member of the GOAP since 2020.

113. What are Marine Protected Areas (MPAs)?

While there is no single universally agreed definition, the IUCN defines MPAs as "a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values"[71]. MPAs are safeguarded through legal protections or other effective methods, such as customary practices.

Pollination

114. What is Pollination?

Pollination[72] is the biological process through which pollen is transferred from the male reproductive structures of a flower (anthers) to the female structures (stigmas), enabling fertilization and subsequent seed and fruit formation. This pollen movement often depends on external vectors (animals, wind, water). This process is fundamental to the reproduction of flowering plants and is essential for maintaining plant populations in both natural and agricultural ecosystems. Pollination can occur through biotic agents such as insects, birds, and bats, or through abiotic agents such as wind and water. Without pollination, many plants would fail to reproduce, leading to declines in food availability and ecosystem stability.

115. Why are pollination services classified as ecosystem services?

[69] https://pib.gov.in/PressReleasePage.aspx?PRID=2079735#:~:text=The%20Coastal%20Regulation%20Zone%20(CRZ,active%20mudflats%2C%20Turtle%20nesting%20grounds%2C

[70] https://www.oceanaccounts.org/about-the-global-ocean-accounts-partnership/

[71] https://www.cbd.int/doc/c/6505/efdc/90487e71edd1badede1c16cc/mcb-em-2018-01-oecd-submission1-en.pdf

[72] https://www.fs.usda.gov/managing-land/wildflowers/pollinators/what-is-pollination

Pollination services are classified as ecosystem services because they represent a natural process that provides direct and indirect benefits to humans. By enabling plant reproduction, pollination supports food production, raw materials, livelihoods, and biodiversity. Ecosystem services such as pollination are not always traded in markets, yet they contribute significantly to agricultural productivity and ecological resilience. Their recognition as ecosystem services highlights the dependence of human well-being and economic systems on healthy ecosystems.

In SEEA-EA framework, Pollination services are the ecosystem contributions by wild pollinators to the fertilization of crops that maintains or increases the abundance and/or diversity of other species that economic units use. This may be recorded as a final or intermediate service.[73]

116. Who are pollinators and why are they important?

Pollinators[74] include a wide range of animals such as bees, butterflies, moths, beetles, flies, birds, and bats. These organisms transfer pollen while feeding on nectar or pollen from flowers. Pollinators are vital because they enable genetic exchange between plants, support plant diversity, and ensure the regeneration of ecosystems. Bees, in particular, are among the most effective pollinators due to their foraging behaviour and close association with flowering plants. Some mammals such as squirrels, monkeys, rodents, and even snails in humid environments also participate in pollination.

117. What is abiotic pollination?

Abiotic pollination is a mode of pollination in which non-living physical agents such as wind, water, or gravity facilitate the transfer of pollen from the anther to the stigma without the involvement of animals. It is predominantly associated with open terrestrial ecosystems, such as grasslands and agricultural fields, as well as aquatic environments where animal pollinators are absent or ineffective.

118. What is Wind pollination?

Wind pollination, also known as anemophily, is a form of abiotic pollination in which pollen is transported by air currents. Plants adapted to this mode produce large quantities of light, dry, and non-sticky pollen to enhance dispersal. Flowers are generally small, inconspicuous, and lack colour, scent, and nectar. Stigmas are often large and exposed to effectively trap airborne pollen. Wind pollination is common in grasses and cereal crops, and its

[73] https://www.fao.org/pollination/en/

[74] https://www.pollinator.org/pollinators

efficiency is influenced by wind speed, plant density, and atmospheric humidity.

119. What is Water pollination?

Water pollination, or hydrophily, is a type of abiotic pollination in which water acts as the medium for pollen transfer. Pollen may be transported either on the water surface or submerged beneath it. This mode is restricted to aquatic plants and involves special adaptations such as floating pollen, elongated stigmas, and free-floating male flowers. Although limited in occurrence, water pollination is ecologically significant in freshwater and marine ecosystems where insect pollinators are absent.

120. What is Gravity pollination?

Gravity pollination, also known as geophily, occurs when pollen grains fall directly from the anther onto the stigma under the influence of gravity. This mode is rare and is mainly observed in small or self-pollinating plant species. It provides reproductive assurance in situations where other pollinating agents are unavailable or ineffective, but it lacks efficiency in promoting cross-pollination.

121. What is biotic pollination?

Biotic pollination refers to the transfer of pollen from the anther to the stigma with the help of living organisms, primarily animals. It is considered more efficient than abiotic pollination because biotic agents ensure targeted and precise pollen transfer. Plants relying on biotic pollination exhibit specialised floral traits such as bright colours, distinct scents, nectar rewards, and structural adaptations that attract and guide pollinators, thereby enhancing reproductive success.

122. What is Insect Pollination?

Insect pollination, or entomophily, is the most widespread form of biotic pollination. Insects act as effective pollinators due to their mobility and frequent flower visits. This mode plays a crucial role in maintaining biodiversity in natural ecosystems and is vital for agricultural productivity, as a large proportion of food crops depend on insect pollinators for fruit and seed formation.

123. What is Bee Pollination?

Bee pollination, known as melittophily, is one of the most efficient forms of biotic pollination. Bees possess hairy bodies and specialised pollen-collecting structures that facilitate pollen transfer. Their floral constancy, or repeated visits to the same plant species, enhances pollination efficiency. Bee pollination is critical for crop yields and global food security.

124. What is Butterfly and Moth Pollination?

Butterfly pollination, or psychophily, involves brightly coloured, visually attractive flowers that bloom during the day. In contrast, moth pollination, or phalaenophily, is associated with pale-coloured, strongly scented flowers adapted for nocturnal activity. Both forms contribute to plant reproduction and promote species diversity and ecological connectivity.

125. What is Beetle Pollination?

Beetle pollination, known as cantharophily, is common in forest ecosystems and is associated with large, open flowers that expose pollen. Beetles play a significant role in the reproduction of several primitive and early-diverging flowering plants, making this mode of pollination important from an evolutionary perspective.

126. What is Fly Pollination?

Fly pollination, or myophily, involves flowers that are dull-coloured and emit strong or unpleasant odours. Although flies are generally less efficient pollinators than bees, they are particularly important in cooler regions and under adverse environmental conditions where other pollinators are scarce.

127. What is Bird Pollination?

Bird pollination, or ornithophily, involves birds such as sunbirds that pollinate brightly coloured, tubular flowers rich in nectar. During feeding, pollen adheres to the birds' beaks and feathers, enabling effective pollen transfer. This mode is especially important in tropical and subtropical ecosystems.

128. What is Bat Pollination?

Bat pollination, also known as chiropterophily, is carried out by nocturnal bats that visit large, pale-coloured, strongly scented flowers producing abundant nectar. Bat pollination supports tropical ecosystem productivity and is essential for the reproduction of several economically important fruit-bearing plants.

129. What is Pollination Attributed Value of Output (PVO)?

Pollination Attributed Value of Output (PVO) is an economic measure that represents the share of the total value of agricultural crop output that is directly attributable to animal pollination. It quantifies the contribution of pollinators such as insects, birds, and bats , to crop production by estimating how much of the crop's market value depends on pollination services.

PVO is calculated by multiplying the total value of crop production by the pollination dependency ratio of that crop. The dependency ratio reflects the proportion of yield reduction that would occur in the absence of animal pollination. Crops differ in their level of dependence on pollinators, ranging from essential dependence (where production would largely fail without pollinators) to modest or negligible dependence.

This indicator is widely used in environmental-economic accounting and ecosystem services valuation to highlight the economic importance of biodiversity and pollinators in agricultural systems. By expressing pollination services in monetary terms, PVO helps policymakers understand the economic risks associated with pollinator decline and supports the integration of ecosystem services into agricultural, biodiversity, and sustainability policies.

Residuals

130. What are Residuals and its types?

Residuals are flows of solid, liquid and gaseous materials, and energy, that are discarded, discharged or emitted by establishments and households through processes of production, consumption or accumulation.

There are a wide variety of different types of residuals. The most widely accepted groupings of residuals are Solid Waste, Wastewater, Emissions, Dissipative uses of products, Dissipative losses and Natural resource residuals.

131. What are Solid Waste Accounts?

Solid wastes are the discarded material that are no longer required by the owner or user[75]. These include Chemical and Health care wastes, Radioactive wastes, Metallic wastes, Other recyclables, discarded equipment and vehicles, animal and vegetal wastes, mixed residential and commercial wastes, mineral wastes and soil, combustion wastes and other wastes.

Solid waste accounts, part of SEEA- CF, are 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. Measures of the amount of waste in aggregate or of quantities of specific waste materials is an important indicator of environmental pressure. The construction of solid waste accounts allows these indicators to be placed in a broader context with economic data in both physical and monetary terms.

132. What is Solid Waste and its types?

A "solid waste" is defined as any discarded material that is abandoned by being disposed of, burned or incinerated, recycled or considered "waste-like." A solid waste can physically be a solid, liquid, semi-solid, or container of gaseous material[76].

[75] SEEA Central Framework - https://seea.un.org/content/seea-central-framework
76 https://idahopublichealth.com/environmental-health/solidwaste

In India, Solid Wastes are classified in to 6 components by Law namely

(i) **Municipal Solid Waste**: Municipal solid waste includes garbage (highly decomposable objects, such as food), trash (bulky items, such as tree branches or old appliances), and rubbish (slowly decomposable items, such as paper, glass, or metal objects) and plastic items. Municipal solid waste includes commercial and residential wastes generated in a municipal or notified areas in either solid or semi-solid form excluding industrial hazardous wastes and bio-medical wastes.

(ii) **Hazardous Waste**: The hazardous wastes belong to a category of special wastes containing certain chemicals, metals and pathogenic organisms which can cause damage to the environment even at low concentration. If not properly managed for safe disposal, it can have frightening environmental repercussions. Indiscriminate disposal of these wastes into the environment without proper treatment could lead to pollution of river water, land and groundwater resources.

Hazardous wastes are so defined because of their special characteristics, such as toxicity, corrosively, flammability and reactivity. Hence, it is necessary to take precautionary measures so that the hazardous component in the wastes are rendered harmless through proper treatment and safe disposal methods.

(iii) **E-waste**[77]: The growing convergence of information, communication and entertainment has given a new impetus to the Electronics Hardware Sector which comprises mainly of four sub-sectors namely:

a. Industrial Electronics;
b. Computers and peripherals;
c. Communication & Broadcast Equipment;
d. Strategic Electronics and Components.

Increased utilization of electronics goods particularly in the IT (Information Technology) sector due to wide choices and their rapid obsolescence have resulted in generation of voluminous and unmanageable E-wastes quantities. An important aspect of these goods is that it is easier and more convenient to replace than to repair these products. E-waste is one of the fastest-growing waste streams today and is growing almost three times the rate of municipal waste, globally. E-waste is highly complex waste to handle due to its varying constituents, it also contains precious metals and many rare materials, which are highly valuable. A computer contains highly toxic chemicals like lead, cadmium, mercury, beryllium, Brominated Flame Retardants (BFRs), PVC (Polyvinyl Chloride) and phosphorus compounds.

(iv) **Bio-medical Waste**[78]: Biomedical Waste (Management and Handling) Rules, 1998 of India defines bio-medical waste as "Any waste which is generated during the diagnosis, treatment or immunization of human beings

[77] http://cpcbenvis.nic.in/envis_newsletter/URBAN%20WASTE%20PROFILE_LV.pdf
[78] http://cpcbenvis.nic.in/Bio_Medical_waste.html

or animals or in research activities pertaining thereto or in the production or testing of biologicals. ''

Bio-Medical waste consists of

- Human anatomical waste like tissues, organs and body parts
- Animal wastes generated during research from veterinary hospitals
- Microbiology and biotechnology wastes from laboratory, culture stocks or specimens of micro-organisms, live or attenuated vaccines, human and animal cell culture used in research
- Waste sharps like hypodermic needles, syringes, scalpels and broken glass
- Discarded medicines and cytotoxic drugs comprising of outdated, contaminated and discarded medicines
- Soiled waste such as cotton balls used while blood collection or used as absorbent material for accidental blood and body fluid spillage
- Solid waste such as dressing, bandages, plaster casts, material contaminated with blood, tubes and catheters
- Liquid waste from any of the infected areas
- Incineration ash from incineration of any bio-medical waste
- Chemical wastes generated while testing and analysis

(v) **Plastic Waste**: Plastic waste, or plastic pollution, is 'the accumulation of plastic objects (e.g.: plastic bottles and much more) in the Earth's environment that adversely affects wildlife, wildlife habitat, and humans.

(vi) **Construction and Demolition Waste**[79]: According to US EPA (United States Environmental Protection Agency) (1998) definition, C&D waste is "waste material produced in the process of construction, renovation, or demolition of structures". Global data indicates that approximately 40% of the generated waste portion is from the Construction and Demolition (C & D) from structures which include buildings of all types (residential / non-residential), roads and bridges. C & D waste is bulky, heavy and is unsuitable for disposal either by incineration / composting. This poses a waste management problem particularly in urban areas where land availability for the disposal of ANY waste is a big problem. The components of C&D waste contain any of the following – concrete, asphalt, wood, metals, gypsum wallboard, and roofing.

133. What are Effluents?

Effluents are the waste liquid from domestic sewage, industrial sites or from agricultural processes. Effluents are harmful when they enter the environment, especially in freshwater, because of their polluting chemical composition[80].

[79] http://cpcbenvis.nic.in/envis_newsletter/URBAN%20WASTE%20PROFILE_LV.pdf

[80] https://www.eea.europa.eu/help/glossary/gemet-environmental-thesaurus/effluent

134. What is Dissipative Use of Products?

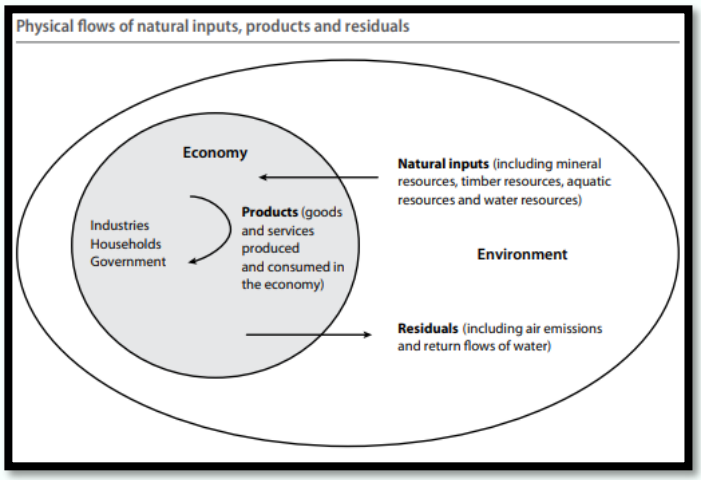
Products that are deliberately released to the environment as part of production processes are called dissipative use of products. Some production processes require that materials be dissipated into the environment. The most common examples relate to agriculture where seeds, fertilizers and manure are dissipated regularly. Other examples are salt and other materials spread on roads for safety reasons, as well as solvents. The following list highlights the major categories for dissipative use of products: Organic fertiliser (manure), Mineral fertilizer, Sewage sludge, Compost, Pesticides, Seeds, Salt and other thawing materials spread on roads (including grit), Solvents, laughing gas and other gases, etc[81].

135. What are Dissipative Losses?

Dissipative losses are the dispersion of materials as a consequence of the corrosion and abrasion of products and infrastructures, leakages, etc. (e.g. rubber worn away from car tires, particles worn from friction products such as brakes, abrasion from roads, losses due to evaporation of e.g. water or other solvents used in paints or other coatings)[81].

136. What are Natural Resource Residuals?

Flows from the environment into the economy are referred to as natural inputs, flows within the economy consist of either products or residuals, and flows from the economy to the environment are residuals.



Source: System of Environmental Economic Accounting 2012— Central Framework

[81] https://seea.un.org/sites/seea.un.org/files/mfa_final_draft.pdf

Some natural inputs, after entering the economy, are recorded as immediately returning to the environment as they are no longer required by the economy. Natural inputs that are not used in production, for example mining overburden, mine dewatering and discarded catch in fishing are called natural resource residuals[51].

137. What are RoHS parameters?

The Restriction of Hazardous Substances (RoHS) Directive is a Directive of the European Union on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE). The RoHS Directive aims to prevent the risks posed to human health and the environment related to the management of electronic and electrical waste. The RoHS Directive currently restricts the use of ten substances: lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE), bis(2-ethylhexyl) phthalate (DEHP), butyl benzyl phthalate (BBP), dibutyl phthalate (DBP) and diisobutyl phthalate (DIBP)[82].

138. What is EPR (Extended Producers Responsibility) ?

Extended Producer Responsibility is a concept where manufacturers and importers of products should bear a significant degree of responsibility for the environmental impacts of their products throughout the product life-cycle, including upstream impacts inherent in the selection of materials for the products, impacts from manufacturers' production process itself, and downstream impacts from the use and disposal of the products. Producers accept their responsibility when designing their products to minimise life-cycle environmental impacts, and when accepting legal, physical or socio-economic responsibility for environmental impacts that cannot be eliminated by design.[83]

139. What are some of the indicators that can be derived from the Solid Waste Accounts?

Using the Physical Supply and Use Table of Solid Waste Accounts, the following Global SDG Indicators can be derived:

Indicator 11.6.1: Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated, by cities

[82] RoHS Directive (europa.eu)
[83] https://www.oecd.org/env/waste/factsheetextendedproducerresponsibility.htm

Indicator 12.4.2: (a) Hazardous waste generated per capita; and (b) proportion of hazardous waste treated, by type of treatment.

Indicator 12.5.1: National recycling rate, tons of material recycled.

In addition, there are certain SDG indicators in National Indicator Framework of SDGs which are based on generation and treatment of wastes such as Indicators 8.4.1 (Proportion of waste recycled vs. waste generated), 11.6.1 (Percentage of waste processed) and 12.4.2 ((a) Hazardous waste generated per capita (in MT/person); and (b) Proportion of hazardous waste treated, by type of treatment). Components of these indicators involve generation of wastes by type and their treatment by type. These can be derived from Physical Supply and Use Tables (PSUT) of Solid Waste Accounts.

Water and Fish

140. What is SEEA-Water Framework?

The System of Environmental Economic Accounts for Water (SEEA-Water) is an integrated approach to water monitoring, bringing together a wide range of water-related statistics across sectors into one coherent information system. The SEEA-Water is the conceptual framework and set of accounts that present hydrological information alongside economic information in a consistent way.

SEEA-Water has three main types of accounts to record the hydrological system and its linkages to the economy:

(i) Physical Flow Accounts: These accounts record the physical flows of water between the environment and the economy. They record the abstraction of water by the economy, how water flows within the economy and the return flows of water back to the environment. Water emission accounts can also be compiled in relation to these flows.
(ii) Physical Asset Accounts: These accounts describe the hydrological cycle over an accounting period. Water stocks and their depletion over the accounting period are presented, including links to the abstraction and consumption of water by the economy.
(iii) Economic Accounts: This set of accounts presents, among others, flows related to water products, information on the costs associated with water use and supply, and information on water-related financing.

141. What is Fish Provisioning Services?

Fish Provisioning Services are the ecosystem services which represents the material contributions to the benefits supplied by freshwater and coastal water ecosystems; i.e. the contributions made by these ecosystems to the fish production. For the estimation of the Provisioning Service, SEEA prescribes

the method of Resource Rent or the Rental Price Method. This service falls under the category of Ecosystem Provisioning Services (Refer Q. 15).

142. What is Inland Fishery?

Fishery is an economic activity that involves harvesting fish or any aquatic organism from the wild (Capture Fisheries) or raising them in confinement (Culture Fisheries/ Aquaculture). It may be Traditional/ Small Scale Fisheries (SSF) for sustenance, or Large-Scale/ Commercial Fisheries for profit.

Inland fisheries are any activity conducted to extract fish and other aquatic organisms from "inland waters". The term "inland waters" is used to refer to lakes, rivers, brooks, streams, ponds, inland canals, dams, and other land-locked (usually freshwater) waters.

143. What is Marine Fishery?

Marine fishery is associated with the culture and capture of fishes in marine waters. Marine fishes spend most or all of their life in seawater, such as Seas and Oceans, having salinity above 30 ppt (parts per thousand). There are about 240 species contributing to the marine fisheries[84]. Example: Sardines, Mackerel, Ribbonfish, Anchovies, Grouper, Cobia, Tuna, etc.

144. What is Aquaculture (fish farming)?

Aquaculture is the farming of aquatic organisms, including fish, mollusks, crustaceans and aquatic plants. Farming implies some sort of intervention in the rearing process to enhance production, such as regular stocking, feeding, protection from predators and so forth[85]. It also implies individual or corporate ownership of the stock being cultivated. Aquaculture plays an important role in food security and nutrition and sustainable livelihoods for coastal and inland communities. Almost all fish produced from aquaculture are destined for human consumption, although by-products may be used for non-food purposes.

Other Accounts

145. What is a Nature-Based Tourism Service?

Nature-based tourism is a general term for recreational travel that depends on the natural landscape or natural resources either as the setting for activities or where the land or resources are themselves the central component of the tourist activity. Such disparate activities as mountaineering, snorkelling, wildlife viewing and photography, fishing, downhill skiing, hunting, biking,

[84] https://nfdb.gov.in/welcome/Fish_and_Fisheries_of_India
85 https://www.fao.org/flw-in-fish-value-chains/value-chain/aquaculture/en/

paddling or rafting, and ecotourism - by no means an exhaustive list - all fit under the umbrella of this term. The ecosystem service of "nature-based tourism" can be defined as providing opportunities for or enabling nature-related tourism and recreation activities. This falls under the category of cultural services of the ecosystem (Refer Q. 20).

146. What are Urban Accounts?

Ecosystem services are the direct[86] and indirect contributions of ecosystems to human well-being. Cities depend on ecosystems both within and beyond the urban environment for a wide variety of goods and services that are essential for economic, social, and environmental sustainability. Ecosystems have the potential in cities to regulate climate, protect against hazards, meet energy needs, support agriculture, prevent soil erosion, and offer opportunities for recreation and cultural inspiration. In many urban areas, particularly in brownfields and other non-used urban land, there are ample opportunities to create novel functioning ecosystems that generate services that enhance the well-being of urban inhabitants.

Ecosystems in urban areas also serve as habitats for species and as storehouses for genetic diversity. Nutrient cycling and soil formation processes are often driven by non-iconic species, such as bacteria or invertebrates; the contribution of biodiversity to these vital ecosystem services often goes unacknowledged or unprotected.

Urban ecosystem accounting provides a framework for quantifying the extent and condition of urban ecosystems and the services they provide and associating these services with beneficiaries.

147. What are 'Thematic Accounts' in SEEA framework?

Thematic Accounts are standalone accounts, or sets of accounts, that organise data around specific policy-relevant themes. Biodiversity, ocean and carbon are three high profile themes. Other important thematic accounts include accounting for protected areas, wetlands, forests and urban areas.

148. What are Material Flow Accounts?

Economy-wide material flow accounts (EW-MFA) are a statistical accounting framework recording, in thousand tonnes per year, material flows into and out of an economy[87]. They cover solid, gaseous, and liquid materials, except for bulk flows of water and air. The general purpose of EWMFA is to describe the physical interaction of the national economy with the natural environment and the rest of the world economy in terms of flows of materials.

[86] https://www.cbd.int/doc/health/cbo-action-policy-en.pdf
[87] https://seea.un.org/content/material-flow-accounts#:~:text=What%20is%20it%3F,in%20the%20SEEA%20Central%20Framework.

EW-MFA is a statistical framework conceptually embedded in environmental-economic accounts and fully compatible with concepts, principles, and classifications of national accounts – thus enabling a wide range of integrated analyses of environmental, energy and economic issues e.g. through environmental-economic modelling. Material flow accounts are one of the many types of accounts covered by the SEEA Central Framework

149. What is Domestic Extraction in Economy wide Material Flow Accounts (EW-MFA)?

Domestic Extraction (DE) is the amount of used material inputs from the environment to the economy. Domestic extraction as defined in EW-MFA includes only the used extraction of material; that is material extracted from the environment by humans and further processed in the economy. According to EW-MFA, it excludes unused extraction[88]. Domestic extraction can be broken down into following four categories:

- Biomass – comprising of organic non-fossil material of biological origin.
- Metal Ores - recorded in terms of gross ore (also known as crude ore), based on their chemical classification as a metal in the periodic table of elements.
- Non-metallic minerals - flows of minerals that are non-metallic based on their chemical classification, such as marble, limestone, sand and gravel.
- Fossil fuels - flows of natural inputs of fossil energy, such as coal, peat, petroleum, and natural gas.

150. What is Direct material input in Material Flow Accounts?

Direct material input (DMI) measures the direct input of materials for use in an economy (excluding bulk flows of water and air)[88].

Direct Material Input (DMI) = Domestic Extraction (DE) + Imports

151. What is Domestic Material Consumption (DMC) in Material Flow Accounts?

Domestic material consumption (DMC) measures the total amount of materials (excluding bulk flows of water and air) that are directly/actually used in a national economy, i.e. by resident units[88].

Domestic material consumption (DMC) = Direct Material Input (DMI) – Exports

[88] https://seea.un.org/sites/seea.un.org/files/mfa_final_draft.pdf

152. What is 'Material Footprint' in respect of a country?

Raw Material Consumption (RMC) is defined as the amount of raw material equivalents (RMEs) required directly and indirectly to produce the products consumed in a given national economy. Often RMC is referred to as 'material footprint'; an indicator gaining more and more policy attention[88].

153. What are some of the indicators that can be derived from the MFA?

A large number of indicators can be established from economy-wide material flow accounts. These indicators generally correspond to the main variables of the EW-MFA accounts and describe material use at different stages of economic activities, from material extraction via international trade and material consumption to the generation of waste and emissions. In line with the materials balance scheme, the main types of indicators can be defined as input indicators, consumption indicators, trade and balancing indicators and output indicators. These different types of indicators deliver complementary information about various aspects related to national material use. They can also be combined to provide a more comprehensive depiction of the related issues. Furthermore, these indicators can be combined with economic indicators, such as Gross Domestic Product (GDP), to construct indicators of material productivity. Depending on the scope of material flows considered, the indicators can be grouped into several categories:

A. Indicators based on accounts of direct material flows, i.e. domestic material extraction and physical imports and exports.

B. Indicators which also include indirect material flows associated with direct imports and exports – these flows are also called raw material equivalents (RME).

C. Indicators which in addition consider unused material extraction, both of domestic and foreign origin.

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