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EnviStats-India
Frequently Asked Questions

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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 published in EnviStats India Vol. II 2022 included in the document
Ver1.2	January 26,2024	Questions related to the new set of accounts published in EnviStats India Vol. II 2023 included in the document

Contents

FREQUENTLY ASKED QUESTIONS

Background- SEEA and other Frameworks

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.

[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

forests; wetlands), biodiversity and ecosystem services, in both physical and monetary terms.

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

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

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.

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[8] 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[9] 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

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

resource use, environmental intensity, environmental protection activity, production of environmental goods and services and environmental assets.

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

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.

9. 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.

10. 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.

11. What is Ecosystem and Ecosystem Accounting?

An ecosystem[10] 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 environment interacting as a functional unit"[11]. 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?

[10] https://stats.oecd.org/glossary/detail.asp?ID=735
[11] CBD, article 2, entitled "Use of terms" https://www.cbd.int/convention/articles/?a=cbd-02

(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.

12. 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.

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.

(v) *Thematic Accounts*: These accounts organize data on themes of specific policy relevance. Examples of relevant themes include biodiversity, climate change, oceans and urban areas.

13. 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 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.

14. 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.

15. 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.

16. 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.

17. What is Net Present Value (NPV)?

Once the yearly unit resource rents have been calculated, they must be discounted back to the reference year, because a given amount of income received in the following year is considered to be worth less than the same amount received in the current year, and the difference is reflected by the discount rate. A discount rate of, for example, 6 % indicates that $106 next year corresponds to $100 this year.

The sum of the discounted future resource rents represents a total net present value of future extraction, which is then assumed to correspond to the value of the total quantity of the mineral and energy resource in situ.

18. 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,

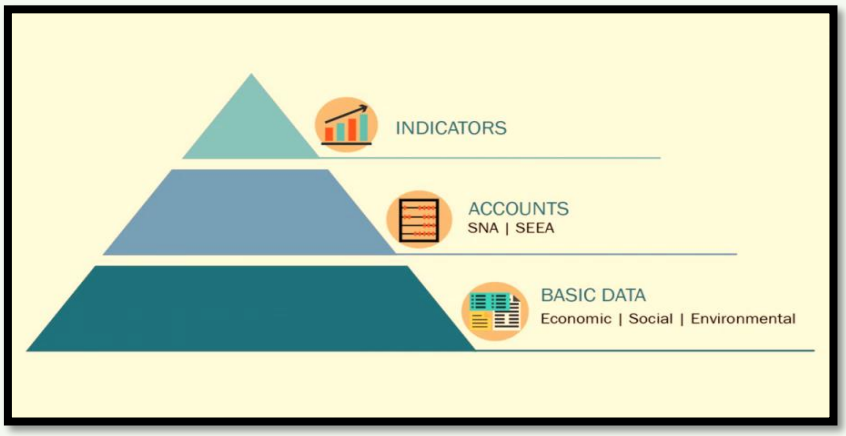
in general, with the SNA. For example, SEEA accounts use the "residence principle" in determining boundaries, so that data is based on the residence of producer units rather than the territory in which activity occurs, the same approach used for Gross Domestic Product.

19. 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.



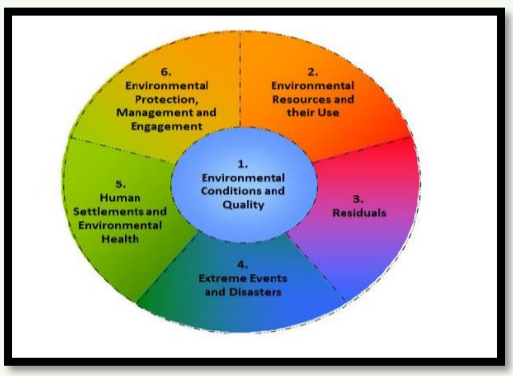
20. What is the Framework for Development of Environment Statistics (FDES)?

The Environment statistics[12] cover a wide range of information and are multi and interdisciplinary in nature. They originate from a variety of institutions that collect 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



[12] *https://unstats.un.org/unsd/environment/FDES/FDES-2015-supporting-tools/FDES.pdf*

21. 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.

Environment and Sustainability

22. 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)[13], 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

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

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.

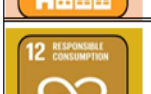
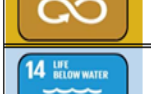
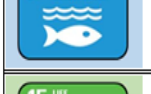
23. How is Environment linked with Sustainability?

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.

Environment Accounts in India

24. 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: Vol. II - 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.

25. 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).

26. Who compiles Climate Change Statistics in India? What are the 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[14] 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 6 publications have been brought out by the Ministry.

27. 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.

28. 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.

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

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.

29. What is Inter-Ministerial Group (IMG)? What is its role?

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.

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 compilation of Environmental Accounts, identifying data gaps and recommending measures for filling the data gap.
- Assessment of Resource requirements and capacity development for the implementation of Environment-Economic Accounting.
- To suggest a roadmap for implementation of sector-wise accounts

30. 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	Change matrix of Land Use – Land Cover (LULC) from 2005-6 to 2011-12 and 2011-12 to 2015-16 Asset Account for Land Use Land Cover (LULC), 2005-06, 2011-12 and 2015-16 Land Degradation Account, 2005-06 and 2015-16 Wetland Extent Account, 2006-07, 2016-17
Ecosystem condition	Soil nutrient indices; Water quality accounts Forest condition account; Cropland condition account

Type of account	Topics covered
Ecosystem services	Crop provisioning services (monetary) Timber and Non-Timber Forest Product (NTFP) provisioning services (monetary) Carbon retention services provided by forests (physical and monetary) Nature-based tourism (monetary) Soil erosion prevention services provided by croplands (physical) Fish Provisioning Services Soil Erosion Prevention Services by Forests (physical)
Thematic Accounts	Biodiversity - Extent of protected areas; State-wise Floral and faunal species accounts; Species Richness of IUCN Red List species
Individual environmental asset accounts (SEEA CF)	Forests – Growing Stocks of Timber and Carbon Water Mineral Energy Material Flow Accounts
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.

31. 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[15] has initially proposed preparation of the Asset accounts in the States and then gradually expand it to the nation and in this direction, GASAB released 'Compendium of Asset Accounts of Mineral and Energy Resources in India'[16] in 2022.

[15] http://gasab.gov.in/gasab/pdf/NR-Accounting.pdf
[16] https://gasab.gov.in/gasab/pdf/Compendium-of-Asset-final.pdf

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

33. What are some priority areas identified by NSO, India for Environment Accounting?

NSO, India released "Strategy for Environmental Economic Accounts in India: 2022-2026"[17] in December, 2021. The document has been developed with an aim to implement concerted efforts towards the goal of strengthening the environmental statistics and environmental accounts for India. The strategy document provides a road-map for development of environmental accounting and also helps provide some goals for the short term and also act as a means for measuring India's progress in the domain of the environment accounting. Following priority area has been highlighted in the strategy documents:

i. Energy Accounts
ii. Material Flow Accounts
iii. Ocean Ecosystem Accounts
iv. Urban Accounts and Biodiversity

34. 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

Mineral and Energy

35. 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[18,19], 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

[17] https://www.mospi.gov.in/sites/default/files/publication_reports/Environment%20Accounting%20Strategy%202022-261638528460762_0.pdf
[18] https://seea.un.org/content/seea-central-framework, https://seea.un.org/seea-energy
[19] https://seea.un.org/seea-energy

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.

36. 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 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.

37. 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.

38.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[20].

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

39. What are various types of additions and reductions in the stock of energy assets?

According to SEEA-Energy, there are 3 types of **additions**[21] to the stock of the 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.

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

• *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

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

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.

40. 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[22]. 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[23], 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).

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

[22] https://www.mdpi.com/2079-9276/10/4/30
[23] http://www.indiaenvironmentportal.org.in/files/expertreport-1.pdf

The asset accounts in SEEA-Energy are compiled only for minerals and energy resources[24]. These accounts provide valuable information to assess the fact whether the current patterns of economic activity are depleting and/or degrading 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.

42. 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.

43. 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:

[24] https://seea.un.org/seea-energy

- 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[25].

44. 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

[25] Energy Statistics 2022, MoSPI

(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)[26], which contains further and more detailed explanations of the recommendations and provide practical guidance for compilers of energy statistics, balances and accounts.

45. 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,[27]

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[28].

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.

[26] https://unstats.un.org/unsd/energy/ESCM_Whitecover_170323.pdf
[27] SEEA Energy
[28] https://link.springer.com/referenceworkentry/10.1007/978-94-007-0753-5_874

Soil, Crop and Forest

46. 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[29]. 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.

47. 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

[29] 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.

A= Mean annual soil loss (metric tons/ ha/ year)
R= Rainfall erosivity factor (megajoules millimeter hectare / hour/ year)
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)

48. 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.

49. 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.

50.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.

51. 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[30] 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. 15).

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

52. 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. 15).

53. 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 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. 15).

Water and Fish

54. 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.

55. 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).

56. 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.

57. 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[31]. Example: Sardines, Mackerel, Ribbonfish, Anchovies, Grouper, Cobia, Tuna, etc.

58. 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[32]. 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.

59. What is Resource Rent?

The economic rent of a natural resource equals the value of capital services flows rendered by the natural resources, or their share in the gross operating surplus; its value is given by the value of extraction. Resource rent may be divided between depletion and return to natural capital[33].

Residuals

60. 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.

61. What are Solid Waste Accounts?

Solid wastes are the discarded material that are no longer required by the owner or user[34]. 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.

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[31] https://nfdb.gov.in/welcome/Fish_and_Fisheries_of_India

32 https://www.fao.org/flw-in-fish-value-chains/value-chain/aquaculture/en/

[33] https://stats.oecd.org/glossary/detail.asp?ID=2332#:~:text=The%20economic%20rent%20of%20a,and%20return%20to%20natural%20capital.

[34] SEEA Central Framework - https://seea.un.org/content/seea-central-framework

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.

62. 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[35].

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[36]**: 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.

35 https://idahopublichealth.com/environmental-health/solidwaste

36 http://cpcbenvis.nic.in/envis_newsletter/URBAN%20WASTE%20PROFILE_LV.pdf

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**[37]: 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 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**[38]: 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 &

[37] http://cpcbenvis.nic.in/Bio_Medical_waste.html

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

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.

63. 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[39].

64. 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[40].

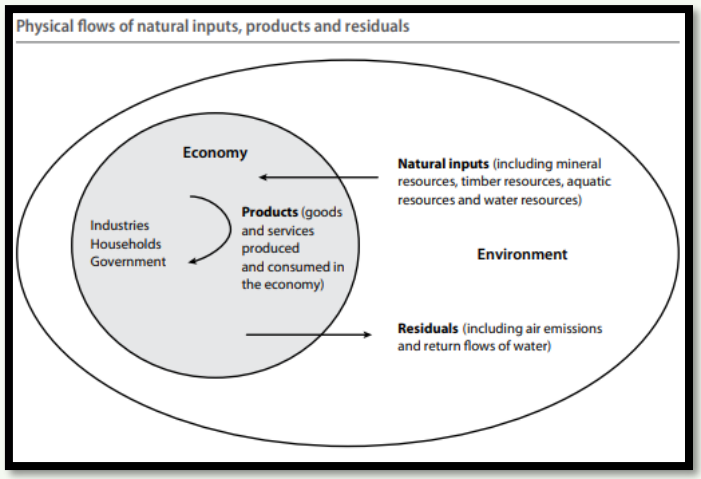
65. What are Dissipative Losses?

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)[40].

66. 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.

[39] https://www.eea.europa.eu/help/glossary/gemet-environmental-thesaurus/effluent
[40] https://seea.un.org/sites/seea.un.org/files/mfa_final_draft.pdf



Source: System of Environmental Economic Accounting 2012— Central Framework

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[18].

67. 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)[41].

68. 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

[41] RoHS Directive (europa.eu)

when accepting legal, physical or socio-economic responsibility for environmental impacts that cannot be eliminated by design.[42]

69. 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

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.

Biodiversity

70. 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

[42] https://www.oecd.org/env/waste/factsheetextendedproducerresponsibility.htm

include temperature, altitude, precipitation, soils and pressures from human activities.

According to the Convention on Biological Diversity (CBD), "Biological diversity[43]" means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of 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[44] 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[45] recognizes the CBD definition of biodiversity, the different components of biodiversity, and the links between economic activity and changes in biodiversity.

71. 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

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

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

[45]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

is rarely greater than 4. The Shannon index increases as both the richness and the evenness of the community increase.

72. What is IUCN?

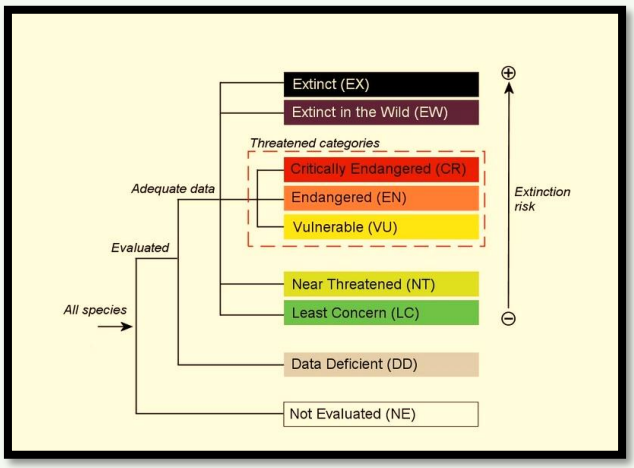
The International Union for Conservation of Nature (IUCN) is an international organization to provide conservation to nature and natural resources in a sustainable way[46]. IUCN was established in 1948. The working principle of IUCN depends on data gathering and analysis, research, field projects, advocacy 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.

73. 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[47]. 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.

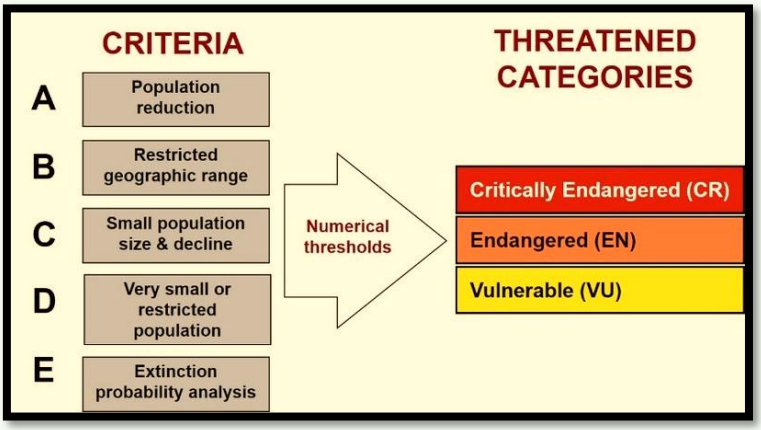
74. What are the IUCN Red List Categories and Criteria?

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



[46] https://www.iucn.org/about
[47] https://www.iucnredlist.org/about/background-history

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.



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'.

75. What are Protected Areas?

A Protected Area[48] 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[49] 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.

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

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

76. 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

77. 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[50].

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.

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

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.

Other Accounts

78. 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, 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. 15).

79. What are Ocean Ecosystem Accounts?

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[51].

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?

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

- How are different groups of people benefitting from the ocean, ocean economy? (income or welfare)

80. What are Urban Accounts?

Ecosystem services are the direct[52] 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.

81. 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.

82. 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[53]. 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.

[52] https://www.cbd.int/doc/health/cbo-action-policy-en.pdf
[53] 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

83. 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[54]. 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.

84. 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)[54].

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

85. 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[54].

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

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

86. 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[54].

87. 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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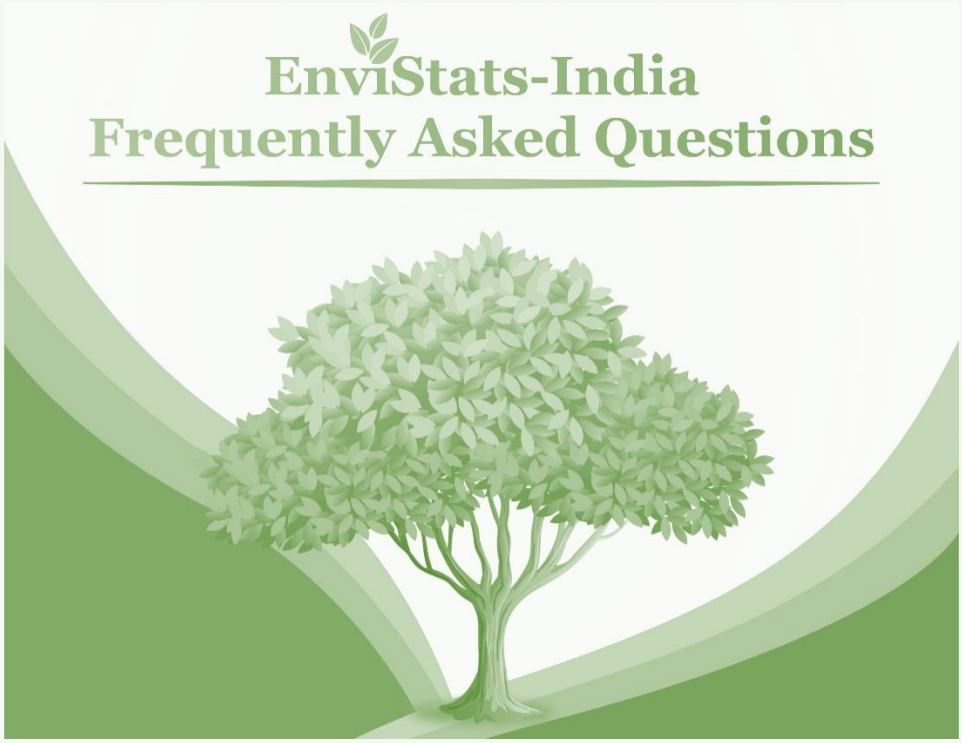

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