DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS
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System of Environmental Economic Accounting

System of Environmental-Economic Accounting— Ecosystem Accounting

Chapter 14 on indicators and combined presentations of the draft document submitted to the Global Consultation on the complete document

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Note: This is just an extract from the complete draft of the SEEA EA that can be accessed at: https://seea.un.org/sites/seea.un.org/files/documents/EEA/Revision/1._seea_ea_complete_draft_for_global_consultation_oct_2020.pdf

14 Indicators and combined presentations

14.1 Introduction

14.1 Given the variety of analytical and policy contexts that are present around the world, it is to be expected that people will consider combining accounts in different ways, or more commonly, focus on combining a subset of accounts that are most relevant for their specific needs. This is perfectly appropriate and should not be seen as suggesting that other combinations of accounting information for different applications or policy framings are inferior or irrelevant. In all cases, there is a need to ensure fitness for purpose both in terms of the accounting integration and the quality of the data required.

14.2 This chapter describes a range of ways in which data from the ecosystem accounts can be combined with other environmental-economic accounting data and national accounting data to demonstrate the links between the economy and the environment and to compare trends over time. Section 14.2 provides a general introduction to the development of combined presentations in which data from different accounts are presented alongside each other. These presentations may be particularly relevant in the derivation of indicators.

14.3 The most common entry point to accounting data is via the lens of indicators that summarize accounting data and convey trends on topics of specific policy relevance. There is a wide array of environmental and sustainability related indicators that have been, in most cases not based on data that has been filtered through an accounting framework. Sections 14.3 and 14.4 explain approaches to the development of aggregates and indicators that can be derived from the ecosystem accounts with a particular focus on the links to reporting on progress towards various global environmental goals.

14.2 Combined presentations for ecosystem accounting

14.2.1 Introduction

14.4 Combined presentations are a way of showing changes in stocks and flows of ecosystems in the context of standard measures of economic activity, without undertaking a valuation of ecosystem services and ecosystem assets in monetary terms. There is room for considerable flexibility in the design of combined presentations. The following sub-sections describe common areas of interest rather than an exhaustive list. While they do not encompass a full integration of information in accounting terms, they can support a more informed discussion of the relationship between ecosystems and economic activity in a manner that takes into account spatial and environmental contexts. Further, they may help support the presentation of indicators for monitoring trends in ecosystem-related outcomes.

14.2.2 Information on environmental activities

14.5 There may be particular interest in combining information on ecosystem services and ecosystem assets with information on expenditure on environmental protection or resource management. If the information on relevant economic activity is organized to refer to the same spatial areas and/or ecosystem types, this would facilitate the monitoring of the effect

of expenditures on changes in ecosystems.[1] For example, information may be combined showing expenditure to restore coastal wetlands with associated changes in ecosystem condition and associated ecosystem services linked to improved ecosystem condition.

14.6 As defined in the SEEA Central Framework,[2] environmental activities are economic activities that have a primary purpose of either environmental protection (the prevention, reduction and elimination of pollution and other forms of degradation); or resource management (preserving and maintaining the stock of natural resources).

14.7 Over time, information gathered on the actual expenditure on restoring ecosystem assets might be complemented by information on flows of ecosystem services, through which a more complete picture of the relationships between ecosystem condition and ecosystem services could emerge. Further, links may be made to analysis of positive and negative externalities, ecosystem disservices and the extent to which expenditures and other policy responses are reducing any negative effects. Indeed, one of the key roles of the ecosystem accounting model is to facilitate the organization of these types of information and thereby furnish support for more detailed analyses in the future.

14.8 The compilation of targeted statistics on the production of ecosystem related environmental goods and services, using the framework of the environmental goods and services sector (EGSS), may also be of interest. These statistics would, for example, provide information on the share of overall value added contributed to the economy through the production of goods and services related to ecosystems and biodiversity (sometimes called the biodiversity economy).

14.2.3 Information on environmental pressures

14.9 Following the same logic as described for environmental expenditures, data concerning environmental pressures such as air emissions, emissions to water and solid waste, may be compared to ecosystem accounting data on ecosystem condition or flows of ecosystem services. The recording of data on environmental pressures such as those just listed is described in the SEEA Central Framework, Chapter 3. Importantly, using a SEEA based recording allows for presentation of the source of the pressure (e.g., emitting industry) to be recorded, in turn supporting the analysis of externalities. To support effective combination and interpretation the information on environmental pressures should be compiled at a sub-national scale that aligns with the ecosystem assets of interest.

14.2.4 Economic dependence on ecosystems

14.10 Although the focus of ecosystem accounting is on the services provided by ecosystems, there is also interest in understanding the significance of the relationship between ecosystems and standard measures of economic activity, such as GDP. For example, it may be of interest to understand the dependency of current measures of agricultural production on ecosystem service such as pollination. Such dependency measures could be focused around the direct impact (e.g., GDP 'at risk' in the absence of the pollination service), but may also take indirect (or supply chain) effects into account by measuring multiplier effects within the economy, using the extended supply and use table described in Chapter 11. In situation where the total

[1] It may be difficult to allocate survey data collected at national level to specific ecosystem assets. Thus, it may be necessary to consider alternative approaches to collecting site specific expenditures, for example through administrative sources.

[2] For details see the SEEA Central Framework, Chapter 4.

value of ecosystem services (expressed as percentage of GDP) is low, it is possible that economic dependency could still be very high.

14.11 It should be accepted that the allocation of economic activity to sub-national spatial areas (such as administrative regions, or catchments) can be conceptually difficult. Therefore, it may be most useful to commence with identification of measures of economic activity for those industries and activities for which a clear link can be established between an ecosystem and the location of the production – for example, agriculture, forestry, fishing, and tourism. Further economic connections may also be identified by tracing supply chains – a topic discussed below in relation to extended supply and use tables.

14.2.5 Information on policy instruments

14.12 Where links between economic units and particular ecosystems can be established, it is also possible to consider integrating information on a range of other transactions that may take place in relation to the economic activity. For example, payments of certain environmental taxes, payments of rent on natural resources, payments of environmental subsidies and similar transfers may be combined with standard economic indicators and indicators of ecosystem services and assets to provide a more complete picture of the relationships between a given ecosystem and the economy. From a general environmental management perspective a comparison of environmental expenditures and environmentally related revenues may be of interest.

14.3 Indicators derived from the SEEA EA

14.3.1 Introduction

14.13 A clear understanding of the environment-economy nexus is critical for a wide range of today's policy questions and global policy initiatives, including the 2030 Agenda for Sustainable Development, Post-2020 Global Biodiversity Framework, Paris Agreement and more, particularly with regard to informing synergies and trade-offs with regard to policy formulation. However, today's policy questions require an understanding of the relationship between the environment and economy that goes beyond information on individual environmental assets (e.g., timber, energy etc.). Increasingly, policy makers are defining sustainability in ways that also incorporate ecosystems and the services they provide to humanity

14.14 These sections describe how information from ecosystem accounts and related accounts can be organized and integrated to provide policy-relevant indicators and aggregates. This is the focus of section 12.4. Section 12.5 reviews how ecosystem accounts can contribute global monitoring frameworks (e.g., SDGs, post-2020 global biodiversity framework) and a range of other indicator frameworks and applications.

14.3.2 Roles and functions of SEEA EA indicators

14.15 A statistical indicator is the representation of statistical data for a specified time, place or any other relevant characteristic, corrected for at least one dimension (usually size) so as to allow for meaningful comparisons. It is a summary measure related to a key issue or phenomenon and derived from a series of observed facts. Indicators can be used to reveal relative positions or show positive or negative change in a regular interval. Indicators are usually a direct input

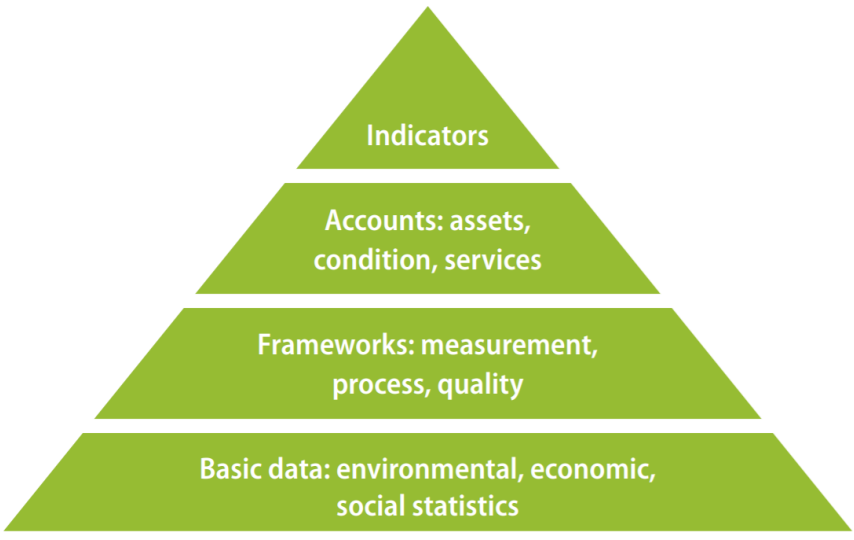
into national and global policies. In strategic policy fields, they are important for setting targets and monitoring their achievement. By themselves, indicators do not necessarily contain all aspects of development or change, but they greatly contribute to explaining them. If consistent methodology is employed, they allow comparisons over time and between, for instance, countries and regions, and in this way assist in gathering 'evidence' for decision making.

14.16 Statistical indicators can serve many purposes, depending on the scale at which they are applied, the target audience, and the quality of the underlying data. Indicators derived from the SEEA EA are useful tools for tracking progress with regards to ecosystems and biodiversity and for mainstreaming these issues into public policy. In doing so, these indicators can help promote the sustainable use of ecosystems and ecosystem services.

14.17 The target audience of SEEA EA indicators usually comprise decision and policy makers in business and government, non-governmental organizations, environmental economists, ecologists, academia and the general public. Thus, it is important that any indicators derived from the SEEA EA are consistent, coherent, and accurately synthesize the underlying data, but are also understandable and meaningful to non-statisticians. SEEA EA indicators must therefore be statistically accurate as well as being straightforward and user-friendly. Indicators derived from the SEEA EA should therefore be seen as summary measures which are fit-for-purpose and are embedded within larger information systems (e.g., accounting frameworks, databases, monitoring systems and models) following consistent methodologies and workflows.

14.18 The relationship between different types of information within the context of the SEEA EA is shown in Figure 14.1. The base of the pyramid comprises a full range of basic statistics and data from various sources including surveys, scientific measurements, administrative entities and censuses. Generally, these data are collected for several purposes and utilize different scopes, frequencies, definitions and classifications.

Figure 14.1: Information pyramid



Source: United Nations et al. (2017), Figure 2.1.

14.19 The role of the SEEA EA is to integrate those data to provide a coherent and unified understanding of ecosystems and their relationship to the economy. This means that

compilers of SEEA EA accounts must reconcile and merge data from disparate sources, taking into account differences in scope, frequency, definition and classification, as appropriate. Once the data have been integrated within a single framework, indicators can be derived that provide insights into the changes in composition or structure of the specific concept of interest, changes in relationships between ecosystem stocks and flows, and other features, taking advantage of underlying relationships between the accounts.

14.20 Just as a myriad of indicators such as GDP, national saving and national wealth all emerge from a single national accounts framework, so too can a wide range of indicators be derived from the SEEA EA. Moreover, the use of an accounting framework such as the SEEA EA provides significant benefits to the resulting indicators. These benefits include:

- Providing a stable conceptual framework that allows for new indicators to be developed from a coherent source to respond to new policy demands while also allowing for improvements in data collection and methods.
- Providing a broad framework such that different indicators can be seen in context and, as necessary, summary information conveyed in the indicator can be disaggregated to better understand the reasons for change.
- Allowing analysis, including forecasting and projections to build from the same coherent source data as the indicators.
- Support the derivation of early estimates using various assumptions based on benchmark data from the accounting system.

14.21 While indicators can be sourced directly from basic statistics, using an accounting framework necessitates reconciling and harmonizing the underlying data, which results in coherent and consistent indicators. This has the potential to better clarify the demand and priority needs for data – which can better link policy needs to data generation -thereby creating a more sustainable and linked data to decision structure. Further, the alignment of the SEEA EA with the SNA facilitates a consistency between economic and environmental information which ensures the robustness of the indicators sourced from accounts.

14.22 Three main types of indicators are considered:

- Aggregates are statistics for related categories that can be grouped together or aggregated in order to provide a broader picture. Thus, an aggregate is the combination of related categories, usually within a common branch of a hierarchy, to provide information at a broader level to that at which detailed observations are taken. In accounting, the aggregation is usually completed by simple addition, for example summing the areas of ecosystem types across an ecosystem accounting area.
- Composite indices in which different variables are combined using a weighting pattern or aggregation rule to communicate the overall movement or trend. In the SEEA EA, an example of a composite index are measures of ecosystem condition which involve weighting together relevant ecosystem condition indicators.
- Ratio indicators derived by combining data from different accounts, for example the flows of ecosystem services per hectare from different ecosystem types.

14.3.3 Indicators from the ecosystem accounts

14.23 Information from ecosystem accounts can be organized and integrated to provide policy-relevant indicators and aggregates. This section provides an overview of aggregates and indicators that can be derived from the core accounts and some of the thematic accounts. It

also highlights the relevant indicators in the SDGs and the post-2020 global biodiversity framework that can be directly derived from each of the ecosystem and thematic accounts.

14.24 Majority of indicators presented in this section are output indicators that can be directly generated from the SEEA EA accounts for tracking national and global progress. It also contains indicators that have been developed and implemented by the scientific communities, but nevertheless can be derived from the ecosystem or thematic accounts using additional further compilation and analysis.

14.25 Considering the underpinning spatial framework of the SEEA EA and its integration with the SNA, indicators from each ecosystem and thematic account have the potential to crosswalk with other accounts and socio-economic measures to provide integrated measures on the inter-connectiveness and linkage for a range of topics, such as adjusted macro-economic measures, costs of restoration, ecosystem capacity, etc. Thus, indicators from the SEEA EA could also be designed to address distributional and environmental justice issues. Aggregation and disaggregation to administrative units would respond to this ambition.

14.26 Indicators from ecosystem extent accounts. The ecosystem extent account describes the extent of the various ecosystem types presented in an accounting area and how the extent changes within the accounting period. The ecosystem types are based on the IUCN Global Ecosystem Typology (GET), which provides a top level of 4 realms, a 2nd level of 24 biomes and a 3rd level of 89 ecosystem functional groups. Depending on the application, alternative aggregations may be developed to align with the reporting requirements at the national and international level.

Table 14.1: Potential indicators on ecosystem extent

Extent indicators	Spatial unit	Disaggregation	Unit of measurement
Percentage of ecosystem accounting area covered by specific types, including: urban areas (IUCN GET T7.4) agricultural areas (IUCN GET T7.1, T7.2, T7.3) forests (IUCN GET T1, T2) wetlands (IUCN GET F1, F2, TF1, FM1, MFT1)	Ecosystem accounting area	Ecosystem type	Hectares; % of opening
Change of area covered by specific ecosystem types during an accounting period, including: urban areas (IUCN GET T7.4) agricultural areas (IUCN GET T7.1, T7.2, T7.3) forests (IUCN GET T1, T2) wetlands (IUCN GET F1, F2, TF1, FM1, MFT1)	Ecosystem accounting area	Ecosystem type	%
Percentage of area unchanged (opening stock – reduction),	Ecosystem accounting area	Ecosystem type	Hectares; % of opening
Percentage of area changed (additions + reductions),	Ecosystem accounting area	Ecosystem type	Hectares; % of opening

14.27 Indicators from ecosystem condition accounts. The ecosystem condition account records data on the state and functioning of ecosystem area within an ecosystem accounting area using a combination of relevant variables and indicators. The selected variables and indicators reflect changes over time in the key characteristics of each ecosystem asset. Ecosystem condition accounts are compiled in physical terms. Ecosystem condition indexes and sub-indexes are

composite indicators that are aggregated from (ecosystem condition indicators. The use of compatible reference levels (e.g., through a common reference condition) underpins the aggregation process. Many condition indicators are developed and implemented by the scientific communities that can be integrated into the condition accounts of the SEEA EA for further aggregation.

Table 14.2: Potential indicators on ecosystem condition

Ecosystem condition indicators	Further description	Spatial unit	Disaggregation	Unit of measurement
Overall ecosystem condition index		Ecosystem accounting area	Ecosystem type, ecosystem condition classes	Index
Physical state indicator	Overall physical state characteristics of an ecosystem asset (including characteristics on soil structure, water availability)	Ecosystem type	Ecosystem condition sub-classes	Index
Chemical state indicator	Overall chemical state characteristics of an ecosystem asset (including characteristics on soil nutrient levels, water quality, air pollutant concentrations)	Ecosystem type	Ecosystem condition sub-classes	Index
Compositional state indicator	Overall compositional state characteristics of an ecosystem asset (including characteristics on species diversity)	Ecosystem type	Ecosystem condition sub-classes	Index
Structural state indicator	Overall compositional state characteristics of an ecosystem asset (including characteristics on vegetation, biomass, food chains)	Ecosystem type	Ecosystem condition sub-classes	Index
Functional state indicator	Overall functional state characteristics on an ecosystem asset (including characteristics on ecosystem process, disturbances regimes)	Ecosystem type	Ecosystem condition sub-classes	Index
Landscape / seascape indicator	Overall characteristics on landscape (including landscape diversity, connectivity fragmentation, embedded semi-natural elements in farmland)	Ecosystem type	Ecosystem condition sub-classes	Index

14.28 Indicators from the physical ecosystem services flow account. The physical ecosystem services flow accounts describe the ecosystem services generated by ecosystem asset in volume terms. The ecosystem services are classified as provisioning, regulating and maintenance, and cultural services. Indicators from the accounts commonly focus on measuring the supply side of ecosystem service flows in physical units such as cubic metres and tonnes, but quantification of ecosystem contributions can also take place through a focus on the use of ecosystem services.

Table 14.3: Potential indicators on physical ecosystem services flows

Physical ecosystem services flow indicators	Further description	Spatial unit	Disaggregation	Unit of measurement

Amount of biomass generated	Biomass provisioning services	Ecosystem accounting area	Ecosystem type; Type of biomass	Tonnes
Water abstracted for use by household and industry (proxy measure)	Water supply services	Ecosystem accounting area	Ecosystem type	Cubic metres
Tonnes of carbon retained (captured and stored/trend in the carbon sequestered)	Global climate regulation services	Ecosystem accounting area	Ecosystem type	Tonnes
Tonnes of airborne pollutants captured (e.g., PM10; PM2.5)	Air filtration services	Ecosystem accounting area	Ecosystem type; type of pollutant	Tonnes
Tonnes of waterborne pollutants removed (e.g., chemical oxygen demand) from wastewater	Water purification services	Ecosystem accounting area	Ecosystem type, type of pollutant	Tonnes
Number of properties/ km of coast/shoreline/riparian zone protected; change in degree of risk	Flood mitigation services	Ecosystem accounting area	Ecosystem type	Count/km
Number of tourist/recreation visits	Recreation-related services	Ecosystem accounting area	Ecosystem type	Count

14.29 Indicators from the monetary ecosystem services flow account and ecosystem asset account. The monetary ecosystem services flow accounts describe the ecosystem services generated by the ecosystem asset in monetary term. The monetary ecosystem asset account describes the opening and closing monetary value of ecosystem assets over an accounting based on the net present value of the bundles of ecosystem services, under their current use/institutional regime. When compiled for multiple years, the asset account identifies the share of the cost of degradation and /or enhancement (e.g., restoration) of ecosystem assets that can be identified by exchange value.

Table 14.4: Potential indicators on monetary ecosystem services flows account and ecosystem asset accounts

Monetary indicators	Further description	Spatial unit	Disaggregation	Unit of measurement
Gross Ecosystem Product (GEP)	The economic value added of all ecosystem services generated	Ecosystem accounting area	Ecosystem type, ecosystem services classes	Local currency
Value of ecosystem services linked to industry value added	Value added of industries with direct inputs of ecosystem services	Ecosystem accounting area	Ecosystem type	Percentage
Monetary ecosystem asset value		Ecosystem accounting area	Ecosystem type, per capita by administrative areas, planning areas	Local currency
Ecosystem asset value as a percentage of total national wealth		Ecosystem accounting area	Ecosystem type	Percentage

Cost of degradation		Ecosystem accounting area	Ecosystem type, per capita by administrative areas, planning areas	Local currency

14.3.4 Indicators from thematic accounts

14.30 The SEEA EA Chapter 13 provides an introduction to a range of thematic accounts covering biodiversity, climate change, oceans and urban areas. In each of these themes various data are brought together within an accounting umbrella and demonstrate the potential of the suite of SEEA accounts, including those of the SEEA Central Framework, to provide a broad range of data to support discussion of these and other themes. In addition to the above-mentioned accounts, thematic accounts on protected areas and the expenditure accounts from the SEEA Central Framework can support the derivation of related headline indicators for SDGs and post-2020 global biodiversity framework.

14.31 In the discussion of each theme there is a short description of indicators relevant to that theme that can be drawn from the accounts. In addition, on the theme of biodiversity the discussion in Section 14.4 on the links between SEEA EA and global monitoring frameworks highlights relevant connections.

14.4 Indicator frameworks and the SEEA EA

14.4.1 SEEA EA and global indicator monitoring frameworks

14.32 The approach of the SEEA enables countries to adopt a holistic and integrated approach to develop sets of indicators to support the implementation, monitoring and reporting of sustainable development agenda and post-2020 global biodiversity framework. The United Nations Statistical Commission at its 51st Session in March 2020 "*welcomed the background document on interlinkages …… and stressed the importance of the System of Environmental Economic Accounting for monitoring the Goals".* [3] At the same session it "*stressed the importance of the SEEA Experimental Ecosystem Accounting in supplying a common measurement framework for the post-2020 global biodiversity framework and related indicators that are currently being negotiated and are expected to be adopted at the fifteenth meeting of the Conference of Parties to the Convention on Biological Diversity".*[4]

14.33 Post-2020 Global Biodiversity Framework. The post-2020 global biodiversity framework builds on the Strategic Plan for Biodiversity 2011-2020 and sets out an ambitious plan to implement broad-based action to bring about a transformation in society's relationship with biodiversity and to ensure that, by 2050, the shared vision of living in harmony with nature is fulfilled. The framework has four long-term goals for 2050 related to the 2050 Vision for Biodiversity. Each of these goals has an associated outcome for 2030. The framework also has 20 action-oriented targets for 2030 which will contribute to the outcome-oriented goals for 2030 and 2050. Under each goals and targets, there are a set of components and monitoring elements to be monitored in assessing progress towards them.

14.34 The SEEA can support the post-2020 global biodiversity framework as it focuses on measuring ecosystems diversity, their extent, condition and services generated while also helps make

[3] E/2020/24, E/CN.3/2020/37, 51/101, para (g)

[4] E/2020/24, E/CN.3/2020/37, 51/110, para (c)

the case for protecting and conserving biodiversity by providing a full picture of its connection to the economy. In particular, the information generated by the SEEA can be used to inform biodiversity policies in an integrated and holistic manner and develop indicators for monitoring progress toward the biodiversity target. It also plays an important role in streamlining reporting requirement by countries through the adoption of a common framework. This can, in turn, also facilitate better integration between national target tracking and global target tracking.

14.35 Table 14.5 and Table 14.6 list potential headline indicators for a selected set of 2050 Goals and 2030 Targets, which can be compiled from SEEA based accounts and are potentially available via global database.

Table 14.5: Potential indicators for the 2050 Goals (incl. links to related SDG indicators)

Goal	Potential SEEA Indicators
A. The area, connectivity and integrity of natural ecosystems increased by at least [X%] supporting healthy and resilient populations of all species while reducing the number of species that are threatened by [X%] and maintaining genetic diversity	Extent of selected natural ecosystems (forest, savannas and grasslands, wetlands, mangroves, saltmarshes, coral reef, seagrass) (Link to SDG 6.6.1, 11.3.1, 15.1.1)
	Biomass of selected natural ecosystems (forest, savannas and grasslands, wetlands, mangroves, saltmarshes, coral reef, seagrass)
	Red List Index (Link to SDG 15.5.1)
B. Nature's contributions to people have been valued, maintained or enhanced through conservation and sustainable use, supporting the global development agenda for the benefit of all people	The economic value added of all ecosystem services generated (Gross Ecosystem Product)
	Tonnes of carbon retained (captured and stored/trend in the carbon sequestered) in natural ecosystem
D. Means of implementation is available to achieve all goals and targets of the Framework	Government expenditure on protection of ecosystem, biodiversity and landscape

Table 14.6: Potential indicators for the 2030 Targets (incl. links to related SDG indicators)

Target	Potential SEEA Indicators
1. By 2030, [50%] of land and sea areas globally are under spatial planning addressing land/sea use change, retaining most of the existing intact and wilderness areas, and allow to restore [X%] of degraded freshwater, marine and terrestrial natural ecosystems and connectivity among them	Proportion of land that is degraded over total land area (SDG 15.3.1)
2. By 2030, protect and conserve through well connected and effective system of protected areas and other effective area-based conservation measures at least 30% of the planet with the focus on areas particularly important for biodiversity	Coverage of key biodiversity areas by terrestrial protected areas (Link to SDG 14.5.1, 15.1.2 and 15.4.1)
	Coverage of key biodiversity aeras by protected areas in relation to marine areas (SDG 14.5.1)
3. By 2030, ensure active management actions to enable wild species of fauna and flora recovery and conservation, and reduce human-wildlife conflict by [X%].	Red List Index (Link to SDG 15.5.1)
4. By 2030, ensure that the harvesting, trade and use of wild species of fauna and flora, is legal, at sustainable levels and safe.	Proportion of fish caught within biologically sustainable levels (Link to SDG 14.4.1)
5. By 2030, manage, and where possible control, pathways for the introduction of invasive alien species, achieving [50%] reduction in the rate of new introductions, and control or eradicate invasive alien species to eliminate or reduce their impacts, including in at least [50%] of priority sites.	Adoption of relevant national legislation and adequately resourcing the prevention or control of invasive alien species (Link to 15.8.1)
6. By 2030, reduce pollution from all sources, including reducing excess nutrients [by x%], biocides [by x%], plastic waste [by x%] to levels that are not harmful to biodiversity and ecosystem functions and human health	Proportion of bodies of water with good ambient water quality (SDG 6.3.2)
	Hazardous waste generated per capita (SDG 12.4.2a)
7. By 2030, increase contributions to climate change mitigation adaption and disaster risk reduction from nature-based solutions and ecosystems based approached, ensuring resilience and minimising any negative impacts on biodiversity	Tonnes of carbon retained (captured and stored/trend in the carbon sequestrated) in natural ecosystems
	Number of properties/area of coast protected (coastal protection services) by nature ecosystem.
9. By 2030, support the productivity, sustainability and resilience of biodiversity in agricultural and other managed ecosystems through conservation and sustainable use of such ecosystems, reducing productivity gaps by at least [50%].	Increase yield of crops from pollination
10. By 2030, ensure that, nature based solutions and ecosystem approach contribute to regulation of air quality, hazards and extreme events and quality and quantity of water for at least [XXX million] people.	Tonnes of nitrogen and phosphorus removed from wastewater
	Tonnes of airborne pollutants captured by natural ecosystem
11. By 2030, increase benefits from biodiversity and green/blue spaces for human health and well-being, including the proportion of people with access to such spaces by at least [100%], especially for urban dwellers	Share of green spaces over of the built-up area of cities (Link to SDG 11.7.1)
13. By 2030, integrate biodiversity values into policies, regulations, planning, development processes, poverty reduction strategies and accounts at all levels, ensuring that biodiversity values are mainstreamed across all sectors and integrated into assessments of environmental impacts	Integration of biodiversity into national accounting and reporting systems, defined as implementation of the System of Environmental Economic Accounting (SDG 15.9.1b)

15. By 2030, eliminate unsustainable consumption patterns, ensuring people everywhere understand and appreciate the value of biodiversity, make responsible choices commensurate with 2050 biodiversity vision, taking into account individual and national cultural and socioeconomic condition	Material footprint per capita (SDG 8.4.1, 12.2.1)
	Domestic material consumption per capita (SDG 8.4.1, 12.2.1)

14.36 Sustainable Development Goals. The 2030 Agenda for Sustainable Development was adopted by all United Nations Member States in 2015. It is built around 17 Sustainable Development Goals (SDGs) and 169 targets that represent an ambitious plan for achieving sustainable development and serves as the basis for countries to shape their national policies and priorities. At the heart of the agenda is the recognition that true development must combine economic growth and poverty alleviation with strategies that improve health and education, reduce inequality, while addressing climate change and protecting nature. Thus, the interlinked nature of the SDGs calls for an integrated approach to policy decisions. As the international statistical standard for measuring the environment and its relationship with the economy, the SEEA is well positioned to support integrated policies based on a better understanding of the interactions and trade-offs between the environment and economy.

14.37 Progress toward the 17 goals and 169 targets of the 2030 Agenda are monitored through 244 indicators, entailing the collection of substantial amounts of data. The UN Statistical Commission (UNSC) has encouraged the Inter-Agency and Expert Group on SDG Indicators (IAEG-SDGs), the body tasked with developing and implementing the global indicator framework for the 2030 Agenda, to consider existing standards and frameworks that can improve SDG monitoring, including the SEEA. Recently, the CBD Secretariat, UN Environment and the UN Statistics Division brought a proposal on upgrading the status of Indicator 15.9.1 to the tenth meeting of the IAEG-SDGs, where the group agreed to the proposal and reclassified the indicator from Tier III to Tier II.

14.38 The systems approach of the SEEA make it an ideal framework for directly measuring several SDG indicators and provide supplemental information for numerous others. The United Nations Commission of Experts on Environmental-Economic Accounting (UNCEEA) has spent considerable effort to align the SEEA framework with the SDGs and currently 40 indicators for nine Sustainable Development Goals can be evaluated using SEEA data. Out of the 40 indicators, the UNEP-WCMC & UNSD (2019) assessment of linkages between global indicators and the SEEA, identified a list of 21 indicators, as shown in table 3, that have full alignment with the SEEA, where the SEEA has obvious potential to provide all, or most, of the information required to calculate the indicator or when the indicator clearly represents an input data for an accounting item of interest

Table 14.7: SDG indicators that have full alignment with the SEEA

SDG indicators
6.3.1 - Proportion of wastewater safely treated
6.3.2 - Proportion of bodies of water with good ambient water quality
6.4.1 - Change in water-use efficiency over time
6.4.2 - Level of water stress: freshwater withdrawal as a proportion of available freshwater resources
6.6.1 - Change in the extent of water-related ecosystems over time

8.9.1 - Tourism direct GDP as a proportion of total GDP and in growth rate
11.3.1 Ratio of land consumption rate to population growth rate
11.7.1 Average share of built-up area of cities that is open space for public use for all, by sex, age and persons with disabilities
14.1.1 - Index of coastal eutrophication and floating plastic debris density
14.3.1 Average marine acidity (pH) measured at agreed suite of representative sampling stations
14.4.1 - Proportion of fish stocks within biologically sustainable levels
14.5.1 - Coverage of protected areas in relation to marine areas
14.7.1 - Sustainable fisheries as a proportion of GDP in small island developing States, least developed countries and all countries
15.1.1 - Forest area as a proportion of total land area
15.1.2 Proportion of important sites for terrestrial and freshwater biodiversity that are covered by protected areas, by ecosystem type
15.2.1 - Progress towards sustainable forest management
15.3.1 - Proportion of land that is degraded over total land area
15.4.1 - Coverage by protected areas of important sites for mountain biodiversity
15.4.2- Mountain Green Cover Index
15.5.1 - Red List Index
15.8.1 - Adoption of relevant national legislation and adequately resourcing the prevention or control of invasive alien species
15.9.1 - Progress towards national targets established in accordance with Aichi Biodiversity Target 2 of the Strategic Plan for Biodiversity 2011-2020

14.4.2 Other indicators and applications

14.39 National indicator initiatives. In addition to supporting the reporting of the global indicator initiatives, the approach of the SEEA EA also enables countries to adopt a holistic and integrated approach to develop sets of indicators to support the reporting on progress towards national commitments, policies or strategy. The spatially explicit information generation of SEEA EA enables the effective targeting of policy efforts at both national and sub-national level and across terrestrial, freshwaters and marine areas. The modular and flexible approach allows countries to compiled SEEA EA indicators based on national priorities and data availability.

14.40 The connectivity and coherence of information sourced from the accounts of the SEEA EA Framework and its flexible approach are particularly important when the indicators are designed to support national policies related to sustainable development and conservation of ecosystem and biodiversity.

14.41 National Indicators that benefit most from having their foundation in the SEEA EA include those relate to:

- Contribution of ecosystems and their services to the economy, social wellbeing, jobs and livelihoods
- The condition and health of ecosystems and biodiversity changing over time and the main areas of degradation and enhancement
- Management of natural resources and ecosystems to ensure continued services and benefits such as energy, food supply, water supply, flood control, carbon storage and recreation opportunity
- Progress towards targeted conservation efforts
- Expenditure and the development of economic instrument on nature conservation
- Estimation of a nation's wealth and economic potential once the state of nature is considered
- Assessment of government performance on sustainable development

14.42 The design and implementation of the SEEA EA indicator to support national policy requires strategic planning and the establishment of appropriate institutional mechanisms and arrangements for the ongoing compilation of accounts and subsequent calculation of target indicators. Ultimately, the design implementation of the national indicator monitoring framework should aim to define a coordinated, long term, national programme of work involving a range of users of the accounts and a number of different source data agencies. The national statistical office (NSO) has the fundamental role in coordinating this process.

14.43 Land Degradation Neutrality. The structure of the SEEA EA, with its emphasis of spatial analysis of ecosystems in terms of their extent, condition and ecosystem services, corresponds well to the data needs for monitoring land degradation neutrality (LDN). The three global LDN indicators (land cover, land productivity, and carbon stocks) that are used to derive SDG Indicator 15.3.1 — proportion of land that is degraded over total land area — can all be derived from existing core SEEA accounts:

- SEEA land accounts present detailed spatial data on land cover.
- SEEA ecosystem condition accounts measure the overall quality of an ecosystem asset with a range of variables including soil organic carbon (SOC).
- SEEA ecosystem services accounts measure the global climate regulation services provided by the ecosystem.

14.44 The UNCCD encourages countries to supplement their monitoring with additional indicators for ecosystem services and social outcomes that address their national or sub-national priorities. The SEEA's alignment with the System of National Accounts means that data organized under the framework can be integrated and used with existing economic accounts relatively easily. As the principle of neutrality will usually involve offsetting degradation in some areas with improvements in others, the SEEA's comprehensive framework provides information for helping identify key trade-offs and the spatial targeting of restoration efforts.

14.45 Intergovernmental and Science policy Platform on Biodiversity and Ecosystem Services (IPBES). The overall objective of the IPBES is to provide policy relevant knowledge on biodiversity and ecosystem services to inform decision making, with four agreed functions on assessment, policy support tools development, capacity building and knowledge development. A conceptual framework has been developed to support the analytical work of the Platform, to guide the development, implementation and evolution of its work programme, and to catalyse a positive transformation in the elements and interlinkages that are the causes of detrimental changes in biodiversity and ecosystems and subsequent loss of

their benefits to present and future generations. It includes six interlinked elements constituting a social-ecological system that operates at various scales in time and space:

14.46 A task group on indicators was established to advise on the indicators and metrics to be used in IPBES products and on the standards necessary for capturing and managing associated data. It aims to provide the authors of ongoing assessments with a set of indicators that cover all elements of the IPBES conceptual framework. The IPBES set of indicators includes two types of indicators: 1) a list of core indicators, which authors are urged to use (in addition to other indicators or data sources they may choose) in their work; 2) a list of highlighted indicators, which authors may be interested in using, but with no expectation regarding their consistent use in the assessments. A number of IPBES indicators were identified as being able to be supported by SEEA based accounts:

- Total wood removals
- Inland fishery production
- Nitrogen use efficiency
- Trend in Carbon Intensity
- Land under cereal production

14.47 RAMSAR Convention on Wetlands. The Ramsar COP in 2005 agreed an initial set of 8 ecological outcome-oriented indicators, for assessing the effectiveness of aspects of the Convention's implementation. 8 indicators were available during the 2006-2008 triennium - they covered wetland resource status and threats, Ramsar site status and threats, water resources status, wetland management, species/population status, threatened species and Ramsar Site designation progress. An additional 2 sub indicators were developed to further examine the status of wetlands - status and trends in ecosystem extent, and trends in conservation status.

14.48 Across the 4 strategic goals a total of 19 targets are specified in the strategic plan. In order to track progress towards the Strategic Targets of the convention, a series of indicator questions are posed to countries in Section 3 of the national report template for the Ramsar Convention, which should be completed for each conference of contracting parties. A number of indicators were identified as being able to be supported by SEEA based accounts:

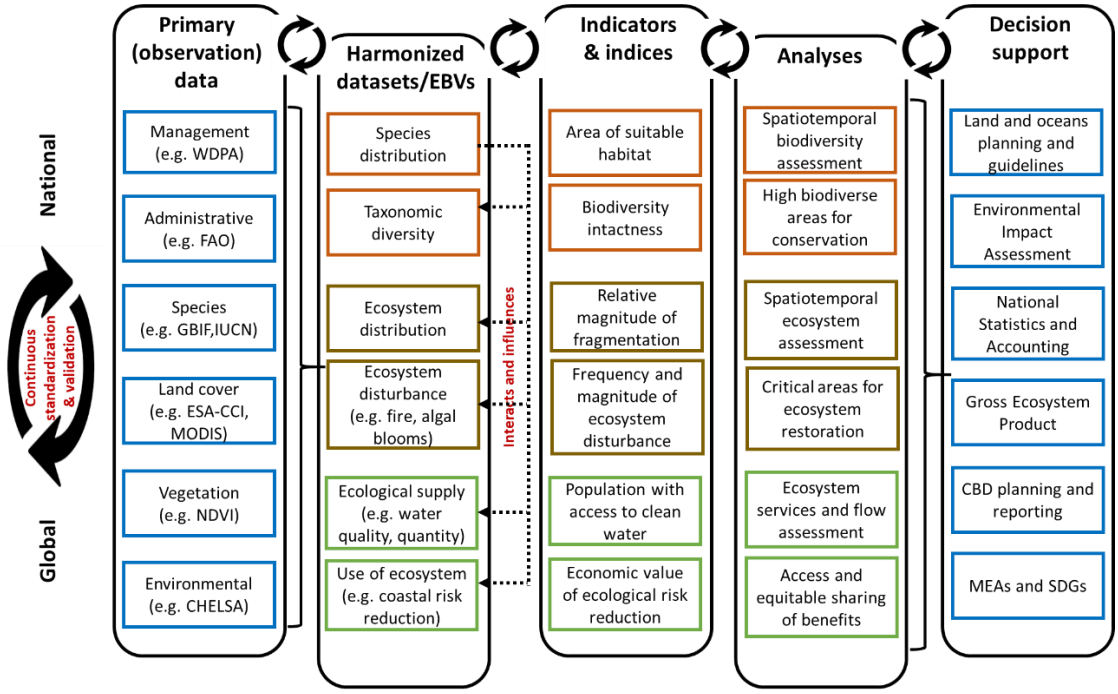
- Trend in wetland condition
- Number of households linked to sewage system
- Percentage of sewage coverage in the country
- Number of wastewater treatment plants

14.49 The Group on Earth Observations – Biodiversity Observation Network (GEO BON). GEO BON is a global network working to improve the acquisition, coordination and delivery of biodiversity observations for decision-making. As a network representing key biodiversity data providers operating at local, national, regional and global scales and through its efforts to design and implement structured and interoperable, national biodiversity observation networks, the GEO BON network has direct utility to the implementation of the SEEA EA process as a whole and in particular with regard to the production of natural capital accounts and related indicators. Of particular relevance is the establishment of a scalable and interoperable framework for biodiversity observations, using the concept of Essential Biodiversity Variables (EBVs). The EBVs cover the key dimensions of biodiversity spanning six classes (Species populations, Species Traits, Genetic Composition, Community Composition, Ecosystem Structure, and Ecosystem Function). In addition, a new framework is being

developed for Essential Ecosystem Services Variables (EESVs) that provide a flexible means for measuring change in a wide range of material, non-material and cultural services that biodiversity and ecosystems provide.

14.50 The EBVs and EESVs are being implemented via structured and repeatable workflows that can be applied at multiple scales that connect primary observation data to multiple biodiversity information products (see Figure 14.2 for examples). These workflows are being utilized to develop a new suite of time-series indicators for tracking the status and trends in key dimensions of biodiversity change and patterns. Therefore, both the EBVs themselves and their integrated outputs (e.g., indicators) are of direct relevance to many of the indicators for the SEEA EA indicators initiative. Through the SEEA EA frameworks, which allow flexible, context-relevant and user-specific indicators for development, EBVs and EESVs can provide underlying data products to inform a wide range of policy frameworks, including the CBD, SDGs, MEAs (see Table 14.8 for SEEA EA and GEOBON EBVs crosswalk). Continuous interactions and exchange between biodiversity data developers and national to global statistics authorities will be instrumental in generating demand driven, science-based, and timely SEEA EA indicators in a coherent and consistent manner across scale and sectors.

Figure 14.2: Workflow of Essential Biodiversity Variables (EBVs) from primary data to decision support



Source: Kim & Navarro, n.d., forthcoming.

Table 14.8: Crosswalk of SEEA EA and GEOBON EBV & EESV frameworks (September 2020 version)

SEEA EEA Framework			Ecosystem Extent Account	Ecosystem Condition Account						Ecosystem Services Account		
				Abiotic Ecosystem Characteristics		Biotic Ecosystem Characteristics			Landscape level characteristics			
GEOBON EBV Framework												
Type	Class	EBVs / EESVs		Physical state	chemical state	Compositional state	Structural state	Functional state	Landscape and Seascape	Provisioning	Regulating	Cultural
EBV	Species Populations	Species distribution				x		x				x
EBV	Species Populations	Population abundance				x		x				x
EBV	Community Composition	Taxonomic diversity				x						
EBV	Community Composition	Phylogenetic diversity				x						
EBV	Community Composition	Multi-trophic interaction diversity				x						
EBV	Community Composition	Biomass distribution					x					
EBV	Ecosystem Structure	Ecosystem distribution	x									
EBV	Ecosystem Structure	Ecosystem live cover					x					
EBV	Ecosystem Structure	Ecosystem vertical profile					x					
EBV	Ecosystem Functions	Disturbance						x				
EBV	Ecosystem Functions	Ecosystem phenology						x				
EBV	Ecosystem Functions	Net primary productivity						x				
EBV	Ecosystem Functions	Secondary productivity						x				
EESV	Ecosystem Services	Ecological supply		x	x					x	x	
EESV	Ecosystem Services	Anthropological contribution to supply								x		
EESV	Ecosystem Services	Demand										
EESV	Ecosystem Services	Use								x	x	x

* The table includes those EBVs and EESVs that are currently available for use and excludes Genetic Composition and Species Trait classes. They may fit better with the Biodiversity thematic accounts of SEEA EEA. The EBVs also include marine data products, which can be used in the Oceans thematic account.

Source: Kim & Navarro, n.d., forthcoming.

14.51 Biodiversity Finance Initiative (BIOFIN). BIOFIN provides an innovative approach enabling countries to measure their current biodiversity expenditures, assess their financial needs in the medium term and identify the most suitable finance solutions to bridge their national biodiversity finance gaps. BIOFIN is currently active in 30 countries and has produced intermediate guidance on the categorization of biodiversity expenditures based on 9 categories.

14.52 Ongoing effort is currently undertaken to harmonize the classification system for biodiversity expenditures between BIOFIN, the Environmental Expenditure Accounts of the SEEA Central Framework and the SDG indicators related to expenditure on conservation and sustainable use of biodiversity and ecosystems.

14.53 Inclusive Wealth. The Inclusive Wealth Index is a sustainability index that measures wealth using countries' natural, manufactured, human and social capital. These can be used to complement existing national accounts (which takes GDP into account). Inclusive Wealth Index takes into account natural capital, human capital (e.g., education and wealth) and produced capital (e.g., equipment, machineries, roads) - while taking into account changing factors such as carbon damage, oil capital gains and total factor productivity. These factors are measured within countries, and therefore show rates at national levels. Monetary value of ecosystem asset derived from the monetary ecosystem asset account of the SEEA EA can support the measures of the natural capital component of Inclusive Wealth

14.54 Biophysical modelling. Modelling for SEEA EA is important as there are several challenges in assembling ecosystem accounts to derive indicators. First, the data needed to assemble ecosystem accounts are not typically captured in data sources that statistical offices rely on, such as surveys, administrative data, and censuses. The second challenge is that the SEEA EA is a spatially explicit framework, which ultimately requires mapping of both ecosystems and

ecosystem services. Consequently, even measurements of ecosystem services that are regularly collected through household or agricultural surveys need to be spatially explicit. Finally, reporting environmental data in a way that integrates into accounting frameworks without oversimplifying complex ecological and socioeconomic processes underpinning ecosystem services is challenging. SEEA EA is an attempt to merge disciplinary perspectives from ecology, economics, and accounting by providing a spatially explicit accounting framework for ecosystem services, while also avoiding double counting of the economic contributions of ecosystem benefits.

14.55 Biophysical modelling can fill gaps where information is not readily available, as well as spatially allocate data that is not regularly spatially explicit. Diverse models and tools to estimate the physical supply of ecosystem services have proliferated over the past decade and are quickly evolving, which means uptake for statistical agencies is increasingly feasible. While most biophysical models were not developed specifically for accounting, many models produce results that can be used directly in SEEA EA or produce results that can be modified for use in SEEA EA. Identifying which tools and modelling platforms produce results that align with SEEA EA can facilitate faster adoption of ecosystem accounts.

14.56 Scenario analysis. SEEA EA can be deployed in the application of scenario analysis to support policymaking. The increasing interconnectedness between the natural environment, human societies and their economies implies new challenges and opportunities for policymakers. To adequately take account of such complexities, policymakers require new sources of data and indicators, based on coherent statistical frameworks, that can be transformed into decision-relevant information through the application of innovative, sophisticated modelling techniques.

14.57 The creation and quantification of scenarios with mathematical simulation models allows for the creation of quantitative estimates for various scenarios (e.g., of implementing or not implementing a proposed policy) that can be used to inform the policymaking process. This is policy scenario analysis i.e., an exercise that aims at informing decision making and makes use of scenarios to assess the outcomes and effectiveness of various policy intervention options.

14.58 The SEEA EA, by providing a standardized approach, consistent and coherent data, and, by targeting policy relevance and the involvement of local stakeholders in policy analysis, can both support the use of accounts, further development of modelling approaches and creation of new models, all with the ultimate goal of informing policy decisions. This can happen through:

- Creation of new knowledge about ecosystems and how their extent and quality leads to ecosystem services that benefit communities and human wellbeing. This allows for the incorporation of ecosystems in social and economic assessments.
- Creation of coherent and harmonized accounts, allowing for the development of new models that can make use of such a data framework
- Promotion of the use of a systemic approach that assess (a) the impact of human activity on ecosystem and (b) models that determine the extent to which ecosystems influence human health and human activity.
- Improving the analysis performed with sectoral models, by introducing physical indicators on ecosystem extent, condition, services and hence generating a higher degree of realism.
- Generating knowledge on how existing models could be connected with one another to better represent the relations between society, economy and environment.

- Use of simulations, extending the analysis provided by SEEA, by forecasting or back-casting scenarios.
- Making explicit the importance of site-specific drivers of change, system responses and impacts, with the use of a spatially-explicit analysis that allows to determine the value of ecosystem services based on the location where these are used (i.e., more explicitly assess demand and supply).