System of Environmental Economic Accounting

SEEA-related Indicators
for the Kunming-Montreal Global Biodiversity Framework

ADVANCED DRAFT: Compilation Guidelines for GBF Headline Indicator B.1 Services provided by ecosystems

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This advanced draft of the Compilation Guidelines has been prepared for information for the twenty-eighth meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA-28) of the Convention on Biological Diversity (CBD). The Guidelines are being developed by the United Nations Statistics Division, with the support of an expert group convened under the auspices of the Technical Committee on SEEA Ecosystem Accounting of the United Nations Committee of Experts on Environmental-Economic Accounting (UNCEEA). Their development has also been informed by an Expert Group Meeting on SEEA-related indicators for the Kunming–Montreal Global Biodiversity Framework (GBF), held in February 2026. Following a final Expert Group Meeting scheduled for November 2026, a revised version of the Guidelines will be made available for public consultation.

This version of the guidelines was produced in July 2026 and is available as part of the portfolio of 'other documents' on the SBSTTA-28 webpages and the "SEEA- related Indicators for the Global Biodiversity Framework" project website. It is being circulated for information purposes only, and has not been finalised, endorsed, or released for public consultation.

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Preface

These guidelines have been produced by the United Nations Statistics Division (UNSD) to support monitoring and reporting on the Kunming-Montreal Global Biodiversity Framework (GBF), adopted by the 15th Conference of the Parties of the Convention on Biological Diversity (CBD) in 2022. The production of the guidelines has been funded by the European Union under the "Neighbourhood, Development and International Cooperation Instrument".

The GBF sets out an ambitious pathway to reach the global vision of a world living in harmony with nature by 2050. To support the implementation of the GBF, a monitoring framework has also been adopted as an essential tool for measuring progress towards achieving its ambitious goals and targets. The UNSD is the methodological custodian for two of the 26 headline indicators in the monitoring framework: Indicator A.2 Extent of natural ecosystems and Indicator B.1 Services provided by ecosystems, both of which use the System of Environmental-Economic Accounting (SEEA) Ecosystem Accounting as their methodological basis. The guidelines presented here are intended to support Parties to the CBD in reporting on Indicator A.2, with companion guidelines available for Indicator B.1. In the process of developing these indicators, it is hoped that countries will also advance their journey towards developing the full set of SEEA ecosystem accounts, which can go hand in hand with the suite of indicators for the GBF in enabling better policy, planning and decision-making for achieving the GBF vision of a world living in harmony with nature.

These guidelines have been developed through a collaborative process involving the statistical community and the biodiversity community, under the auspices of the United Nations Committee of Experts on Environmental-Economic Accounting (UNCEEA) including its Technical Committee on SEEA Ecosystem Accounting. The SEEA was initially conceived at the same time as the establishment of the CBD, and these guidelines represent a continuation of the legacy of the statistical and biodiversity communities working together to provide indicators that policy makers, planners, decision makers and the public can use with confidence.

Acknowledgements

To be confirmed.

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Acronyms and abbreviations

CBD	Convention on Biological Diversity
DQAF	Data Quality Assessment Framework
EFG	Ecosystem functional group
EEZ	Exclusive Economic Zone
ES	Ecosystem service
ET	Ecosystem type
FAO	United Nations Food and Agriculture Organisation
FPIC	Free, prior and informed consent
GBF	Kunming-Montreal Global Biodiversity Framework
GDP	Gross Domestic Product
GET	IUCN Global Ecosystem Typology
INCA	Integrated Natural Capital Accounting (project and platform)
IPLCs	Indigenous Peoples and local communities
IUCN	International Union for the Conservation of Nature
SBSTTA	Subsidiary Body on Scientific, Technical and Technological Advice
SEEA	System of Environmental Economic Accounting
SDG	Sustainable Development Goal
SNA	System of National Accounts
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNSD	United Nations Statistics Division

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1 Introduction

The Kunming-Montreal Global Biodiversity Framework (GBF) sets out an ambitious pathway to reach the global vision of a world living in harmony with nature by 2050. Among the Framework's key elements are 4 goals for 2050 and 23 action-based targets for 2030. It also includes a monitoring framework with 26 headline indicators linked to the goals and targets of the GBF, on which all Parties to the CBD are obliged to report progress at regular intervals as part of their national reports to the CBD. More information on the GBF and its monitoring framework is available here.

Two of the headline indicators, A.2 Extent of natural ecosystems and B.1 Services provided by ecosystems, use the System of Environmental-Economic Accounting (SEEA) Ecosystem Accounting as their methodological basis. Metadata sheets for each of the headline indicators, including their rationale and high-level discussion of methods and data requirements, are available as part of the Updated metadata for the headline indicators for the Kunming-Montreal Global Biodiversity Framework.

The **purpose of these guidelines** is to provide practical guidance to countries for compiling and reporting on GBF Indicator B.1 Services provided by ecosystems, building on the metadata for the indicator. The guidelines are intended to be adaptable to countries at different stages of implementation of SEEA Ecosystem Accounting, and with varying levels of data availability and institutional readiness. Preliminary and interim options are provided for countries that have not yet developed SEEA ecosystem accounts, enabling them to compile and report on the indicator even in the absence of existing ecosystem services accounts.

In addition, the guidelines should facilitate a common understanding of the indicator within and across countries. At the national level, the guidelines should support the development of a strategic approach for regular compilation of the indicator. National reporting to the CBD is coordinated through national CBD Focal Points, typically based in a country's environment ministry, while implementation of SEEA Ecosystem Accounting is typically led national statistical offices. This means that developing and reporting on Indicators A.2 and B.1 will require collaboration between the environment ministry and the national statistical office, as illustrated in Figure 1. In addition, most countries will have other national entities with mandates and technical competencies relevant to the development of the indicators, making multi-institutional cooperation essential to ensure credibility and consistency of the indicators and avoid duplication of effort.

The guidelines have been developed to reflect the requirements and guidance provided in various CBD decisions and documents related to the monitoring framework and headline indicators. Central aspects include the need for indicators to reflect diverse value perspectives on biodiversity, the need for national priorities and capabilities to inform compilation of indicators, preference for the use of national datasets as the primary source for compiling indicators, and the importance of indicators being compiled through national processes and monitoring systems. GBF indicators are intended not simply to fulfil global reporting requirements, but to play a central role in informing national biodiversity policy, planning, decision-making and action.

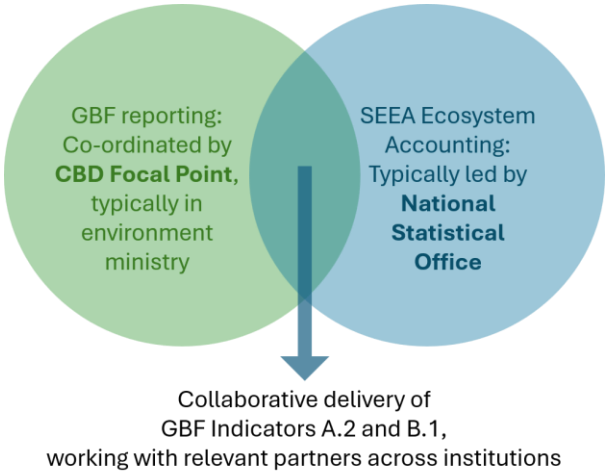

Figure 1. Inter-institutional collaboration is essential for the delivery of the SEEA-related GBF headline indicators

The **main intended users** of these guidelines are the teams of people directly involved in compiling the indicator, who would typically be drawn from several institutions, requiring strong inter-institutional collaboration as emphasised above. National statistical offices already engaged in compiling ecosystem accounts will benefit from this resource, which will help to ensure that their work directly supports the compilation of the indicator. The guidelines may also be useful for those developing datasets used in the indicator, which could be housed in several different institutions. Further, the guidelines are likely to be useful for global partners and initiatives aimed at supporting countries in compiling GBF indicators. Lastly, the guidelines may be useful to those concerned with mainstreaming biodiversity into decision-making using SEEA Ecosystem Accounting, including in the context of Target 14 of the GBF.

These guidelines do not replace the metadata for the indicator. However, *all content from the metadata that is needed for compiling the indicator has been included in these guidelines.* Users of the guidelines may wish to consult the metadata, but the intention is that users should not need to switch between the guidelines and metadata to have a complete picture of the indicator and its compilation.

The metadata for all GBF headline indicators are considered living documents. This version of the Compilation Guidelines for Indicator B.1 corresponds with the version of the metadata submitted to the 28th meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) of the CBD, available in the "Updated metadata for the headline indicators for the Kunming-Montreal Global Biodiversity Framework" (CBD/SBSTTA/28/INF/4, published 3 July 2026). The intention is that future revisions to the metadata will, where necessary, be reflected in subsequent versions of these guidelines.

These guidelines provide:

- A recap of key information from the metadata for the indicator, including the rationale for the indicator and key concepts, definitions and classifications,
- Additional guidance on key concepts and classifications covered only briefly in the metadata, for example, ecosystem service flows and the SEEA Ecosystem Accounting reference list of ecosystem services,

- Further guidance on the role of the IUCN Global Ecosystem Typology, including its ecosystem functional groups, in relation to the indicator,
- High-level guidance on institutional co-ordination required for compiling the indicator,
- A stepwise approach to compiling the indicator, taking into account different levels of readiness and data availability in different countries, including preliminary options for countries that do not yet have ecosystem services accounts,
- Guidance on selecting ecosystem services for inclusion in the indicator at the national level, building on the metadata and the rationale for the indicator,
- Guidance on key national datasets required for the indicator, and on the use of global datasets as an interim option in the absence of national datasets,
- Guidance on computation methods and disaggregations of the indicator,
- Guidance on reporting on the indicator as part of national reporting to the CBD via its Online Reporting Tool.

These guidelines do *not* provide:

- Background or general information on the GBF monitoring framework,
- Detailed guidance on ecosystem accounting methods,
- Guidance on data requirements and measurement methods for specific ecosystem services,
- Detailed guidance on institutional processes at the national level for compiling the indicator, which will vary from country to country according to their national context and circumstances.

See Section 11 for short descriptions of complementary resources that are available.

The guidelines are structured in two parts, shown in Figure 2.

- Part A describes the context and rationale for the indicator, and explains the key concepts, definitions and classifications that underpin it.
- Part B provides a sequence of steps to compile and report on the indicator, with practical guidance on each step.
- The guidelines conclude with a brief description of related resources and a glossary of key terms.

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Figure 2. Structure of the Compilation Guidelines for Indicator B.1

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PART A: CONTEXT, CONCEPTS, CLASSIFICATIONS

2 Context and rationale for the indicator

This section provides the context for Indicator B.1, including the GBF goal and targets to which it relates and its relationship to the suite of ecosystem-related indicators of the GBF. It discusses the rationale for and intent of the indicator, building on the metadata, and outlines the advantages of taking an accounting approach to compiling the indicator. Lastly, limitations and caveats for interpretation of the indicator are set out.

2.1 Indicator B.1 as the headline indicator for Goal B and Target 11

Indicator B.1 Services provided by ecosystems is defined in the indicator metadata as follows: *"the trend in the flows of a set of ecosystem services in a particular time period compared to a baseline year, for a country or globally."*

Indicator B.1 is the sole headline indicator for **Goal B**[1] of the GBF, which focuses on prospering with nature. It reads:

> *"Biodiversity is sustainably used and managed and nature's contributions to people, including ecosystem functions and services, are valued, maintained and enhanced, with those currently in decline being restored, supporting the achievement of sustainable development for the benefit of present and future generations by 2050"*

Indicator B.1 relates to the element in the goal that refers to ecosystem services being *maintained and enhanced, with those currently in decline being restored*.

Indicator B.1 is also the headline indicator for **Target 11** Restore, maintain and enhance nature's contributions to people, which reads:

> "*Restore, maintain and enhance nature's contributions to people, including ecosystem functions and services, such as regulation of air, water, and climate, soil health, pollination and reduction of disease risk, as well as protection from natural hazards and disasters, through nature-based solutions and/or ecosystem-based approaches for the benefit of all people and nature."*

Target 11 has a strong focus on regulating ecosystem services, which has implications for which ecosystem services should be selected for inclusion in the indicator, discussed in Step 1 Deciding on measurement scope (Section 6).

[1] Goal B also has a binary indicator B.b Number of countries with policies or actions for implementing and monitoring the sustainable use of biodiversity and the maintenance and enhancement of nature's contributions to people, including ecosystem functions and services.

2.2 Rationale for Indicator B.1

The metadata for Indicator B.1 includes the following paragraphs relating to the rationale for the indicator:

Ecosystem services are critical for the wellbeing of people and make important contributions to the economy. Examples include harvested wild species, pollination of crops, water purification by filtering and regulating water quality, climate regulation by sequestering carbon dioxide, influencing local and global climate patterns, nature-based recreation and many more. Conserving, managing and sustaining ecosystems and biodiversity is fundamental to maintaining and enhancing ecosystem services.

This indicator aims to track trends in the provision of ecosystem services, responding to the wording in Goal B that ecosystem services should be "maintained and enhanced, with those currently in decline being restored". The index is intended to show whether the provision of ecosystem services is, on average, increasing, stable or decreasing, as well as the rate of these increases or decreases. Together with ecosystem-related headline indicators for Goal A (A.1 Red List of ecosystems and A.2 Extent of natural ecosystems), indicator B.1 provides insight into changes in the state and trends of ecosystems and the services they provide.

The index of change in ecosystem services has the potential to be disaggregated in several ways, including by different categories of ecosystem service and by ecosystem type. As described further in Section 5, ecosystem services can be divided at a broad level into provisioning, regulating and cultural services, often with differing directions of change. Three sub-indices, one for each broad category of ecosystem services, will illuminate these differences. Combined with information from Indicators A.1 and A.2, disaggregation of the overall index by ecosystem type could provide valuable information to direct conservation, management and restoration efforts to enhance ecosystem service provision.

Because the primary purpose of monitoring and reporting on headline indicators is to support Parties in their national implementation of the goals and targets of the Kunming-Montreal Global Biodiversity Framework, the indicator is designed to enable countries to select ecosystem services that they consider important and policy relevant to be included in the indicator, based on guidelines within this metadata document and supporting compilation guidelines. The indicator also reflects ecosystem services that are of global relevance and that will be included in the indicator by all countries. Global aggregation of the indicator will provide a view of global progress towards maintaining, enhancing and restoring ecosystem services. The intended audience of the headline indicator is broad, reflecting the whole-of-society approach of the GBF.

Key points on the purpose and rationale that are emphasised in the metadata for indicator B.1 include:

- The indicator takes the form of an index of change in ecosystem services, intended to track the average trend in the provision of a set of ecosystem services.
- The indicator is intended to be disaggregated in several ways:
    - By broad category of ecosystem service (provisioning, regulating and cultural), providing three sub-indices, as often these will have differing directions of change,
    - By individual ecosystem services, for example if trends in a particular ecosystem service are of policy relevance,
    - By ecosystem type – combined with information from Indicators A.1 and A.2, this could provide valuable information to direct conservation, management and restoration efforts to enhance ecosystem service provision.

- The indicator is designed to enable countries to select a set of ecosystem services that they consider important and policy relevant to be included in the indicator, while also reflecting ecosystem services that are of global relevance.
- An overarching consideration in selecting ecosystem services for the indicator is the degree to which the ecosystem service contributes directly to human wellbeing, along with alignment and compatibility of the ecosystem service with the overall intent of the GBF to conserve, manage and sustain ecosystems and biodiversity.
- The primary focus of the indicator is on ecosystem services rather than ecosystem functions, notwithstanding the wording in Goal B "ecosystem functions and services".
- The indicator is intended to cover ecosystem services supplied by ecosystems in all realms, including terrestrial, freshwater, marine and transitional realms.

Figure 1 shows an example of Indicator B.1 for one country for the period 2013 to 2021, with the overall index disaggregated into sub-indices representing the three broad ecosystem service categories.[2] In this example, the overall index (in black) has remained more or less stable over the period, while cultural services flows (green) have increased relative to the base year of 2013, and flows of provisioning services (red) and regulating services (blue) have decreased. This reveals the importance of having the three sub-indices for provisioning, regulating and cultural services shown alongside the aggregate index, to understand if information on the relative trends in these broad categories of ecosystem services is being masked in the overall aggregation. A regional or global version of the indicator could be developed by aggregating values for multiple countries.

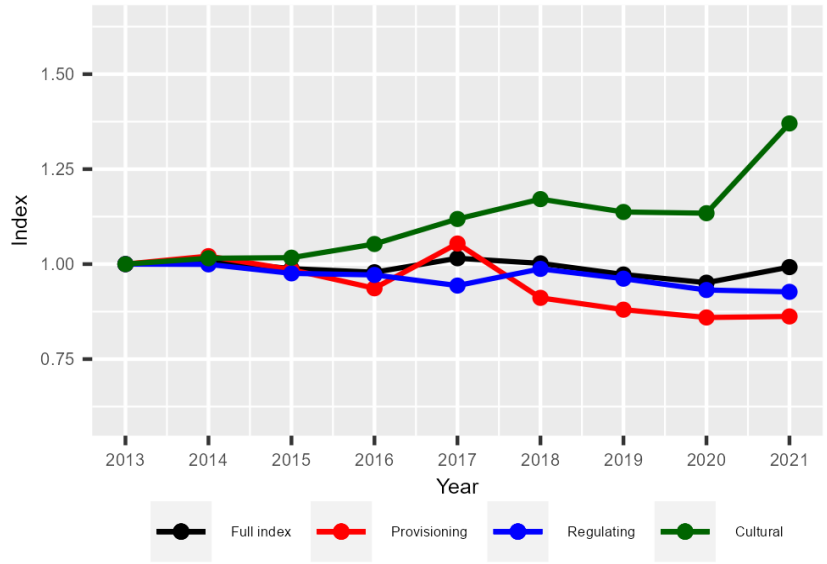

Figure 3. Example of Indicator B.1, showing the overall index and disaggregation into three sub-indices for provisioning, regulating and cultural ecosystem services

The issue of which ecosystem services should be selected at the national level for inclusion in the indicator is central to the compilation and interpretation of the indicator, and should be informed by a clear rationale. This is discussed in Step 1 Deciding on measurement scope (Section 6), which

[2] This example is based on actual data for a country that was involved in testing the development of Indicator B.1 in early 2024.

provides a sequential framework to guide countries in selecting ecosystem services based on globally relevant dimensions, including contributions to human wellbeing and compatibility with the conservation and sustainable use of biodiversity, as well as national-level considerations.

Indicator B.1 focuses on trends in ecosystem service flows and is not intended to capture information on the integrity or condition of the ecosystems that provide those services. The relationship between ecosystem services, ecosystem condition and biodiversity is inherently complex, and changes in ecosystem service flows should not be interpreted as direct evidence of changes in biodiversity or ecosystem condition. The headline indicators for Goals A and B collectively give insight into this complexity, as discussed in Section 2.3.

While Goal B emphasises sustainable development and the wellbeing of future generations, Indicator B.1 is primarily a measure of trends in ecosystem service flows rather than their sustainability. The indicator reflects actual flows of ecosystem services but does not, on its own, reveal whether those flows are occurring within ecological thresholds or can be sustained over time. As a result, increases in in the indicator do not necessarily imply long-term sustainability, and interpreting Indicator B.1 alongside other ecosystem-related indicators is important for understanding the capacity of ecosystems to sustain contributions to human wellbeing over time and for future generations.

The concept of ecosystem services reflects primarily instrumental values of nature. Indicator B.1 thus does not fully capture intrinsic and relational values of nature that may be central to many societies, cultures and knowledge systems, including those from Indigenous People and local communities, as some dimensions of human-nature relationships may not be fully represented through ecosystem service accounting approaches. Also, ecosystem services may be understood differently across societies, cultures and knowledge systems.

The metadata for Indicator B.1 notes that “In addition to the aggregate index in biophysical terms, aggregate *measures of ecosystem services in monetary terms* could be reported by Parties as a component or complementary indicator.” Indicator B.CT.3 Total value of ecosystems services in monetary units was adopted as a component indicator for Goal B in Decision 16/3. While these guidelines do not address developing an indicator of the monetary value of ecosystem services, the biophysical values that underpin Indicator B.1 would be required as a starting point for monetary valuation, should a country wish to compile Indicator B.CT.3. Further guidance on compilation of monetary ecosystem accounts is available in NCAVES & MAIA (2022). For Indicator B.1, only biophysical values for ecosystem services should be included and reported.

2.3 The suite of ecosystem-related GBF indicators

The monitoring framework of the GBF has been developed with the full recognition that it is not possible for any single headline indicator to capture all components or elements of a particular GBF goal or target. Accordingly:

- Many of the goals and targets have more than one headline indicator, capturing different aspects of the goal or target concerned,

- All goals and targets have component and complementary indicators, intended to provide additional information to supplement the headline indicators.

The intention is that all headline indicators should be interpreted and evaluated together with other relevant headline indicators, supported by component and complementary indicators where these are available. They may also be supplemented by additional indicators at the national level.

The five headline indicators of the GBF that deal most directly with ecosystems are set out in Table 1. Together, this set of headline indicators can provide a well-rounded picture of the state of ecosystems, their benefits to society, and interventions to protect and restore ecosystems. The three ecosystem-related headline indicators for Goals A and B (i.e. Indicators A.1, A.2 and B.1) together provide insight into changes in the state and trends of all ecosystems and the services they provide, with each indicator providing different but complementary information. Indicator B.1 does not aim to capture information about the extent or condition of ecosystems that underpin the provision of services, making interpretation alongside Indicators A.1 and A.2 essential to assess whether current ecosystem service flows are being maintained within ecologically sustainable limits over time. In addition, the headline indicators for Targets 2 and 3 provide information on restoration, conservation and protection efforts.

Table 1. Core ecosystem-related headline indicators of the GBF

Headline indicator	**GBF Goal/Target**	**Notes**
A.1 Red List of Ecosystems	Goal A, Target 1	Based on the IUCN Red List of Ecosystems; Methodological custodian: IUCN
A.2 Extent of natural ecosystems	Goal A, Target 1	Based on SEEA Ecosystem Accounting; Custodian: UNSD
B.1 Services provided by ecosystems	Goal B, Target 11	Based on SEEA Ecosystem Accounting; Methodological custodian: UNSD
2.1 Area under restoration	Target 2	Primary custodian: UN Food and Agriculture Methodological custodian (FAO)
3.1 Coverage of protected areas and other effective area-based conservation measures	Target 3	Draws on the World Database of Protected Areas (WDPA); Methodological custodian: UNEP World Conservation Monitoring Centre

At the country level, coordination between the entities responsible for these five indicators is highly recommended, to ensure a coherent approach that leverages common datasets where possible and enables the indicators to be utilised effectively as a suite. In particular, using a common national ecosystem map across the five indicators will greatly facilitate bringing information together to provide a coherent narrative and to be most useful for policy and implementation. National ecosystem maps include a national classification of ecosystem types and spatial datasets of their distribution, discussed further in Section 7.1.2. For coherence in global reporting and analysis, it is useful for countries to cross-reference their national ecosystem classification to the IUCN Global Ecosystem Typology, introduced in Section 4.3.

If all five ecosystem-related headline indicators are disaggregated using a consistent set of ecosystem types, they can help to answer a set of inter-related questions for specific ecosystem types, further illustrated in Figure 4:

- Indicator A.1: Is this ecosystem type threatened (at risk of collapse), and if so to what degree (e.g. Critically Endangered, Endangered or Vulnerable)?

- Indicator A.2: How much of this ecosystem type still exists? Is it extensive or scarce? How much is being lost through conversion to anthropogenic ecosystems? How much is being regained, for example through restoration from anthropogenic to natural ecosystems?
- Indicator B.1: What services does this ecosystem type provide and are they increasing or decreasing?
- Indicator 2.1: How much of this ecosystem type is under restoration efforts?
- Indicator 3.1: How much of this ecosystem type is currently included in protected or conserved areas?

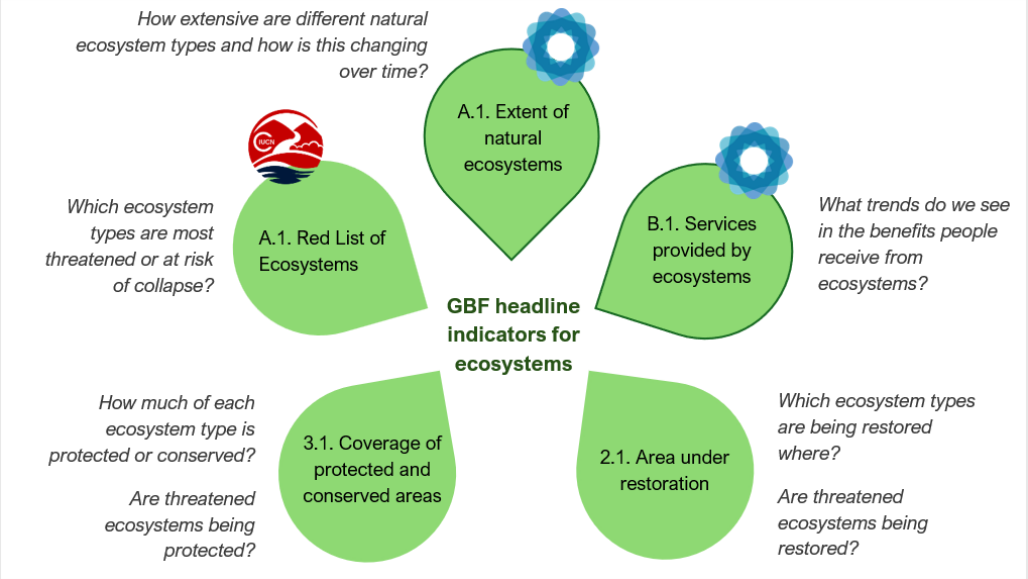

Figure 4. The five core ecosystem-related headline indicators of the GBF together provide insight into a set of inter-related questions about ecosystem types

(Source: Driver & Botts (Eds.), 2026)

In addition to a common national ecosystem map, national data foundations for this suite of indicators include consolidated spatial datasets on ecosystem condition, datasets on the location of protected and conserved areas, consolidated registers of restoration initiatives including spatial information, and nationally comprehensive datasets on ecosystem service flows for priority ecosystem services. Collaboration between institutions mandated to develop and maintain these ecosystem-related data foundations can help to avoid duplication, leverage scarce resources, ensure that datasets are fit for more than one purpose and that the indicators are coherent.

There are several more GBF headline indicators that have an ecosystem element, and viewing them together with the core ecosystem-related indicators could yield useful information and insights:

- 10.1 Proportion of agricultural area under productive and sustainable agriculture,
- 10.2 Progress towards sustainable forest management,
- 12.1 Average share of the built-up area of cities that is green/blue space for public use for all,
- 22.1 Land use and land tenure in IPLC territories (this indicator refers to “natural lands”).

For example, interpretation of Indicator B.1 alongside Indicator 22.1 may provide important contextual information regarding the role of Indigenous Peoples and local communities, territorial governance systems and Indigenous lands in maintaining ecosystem service flows.

A substantial number of the component (CT) and complementary (CY) indicators in the GBF monitoring framework relate to ecosystems. Those that may be relevant to the biophysical measurement of ecosystem services include:

- A.CY.1 Forest area as a proportion of total land area
- A.CY.2 Rate of tree cover loss
- A.CY.4 Continuous global mangrove forest cover
- A.CY.5 Mangrove forest fragmentation
- A.CY.6 Mangrove extent
- A.CY.7 Global salt marsh extent
- A.CY.8 Wetland Extent Trends Index
- A.CY.9 Forest Fragmentation Index
- 8.CY.1 Above-ground biomass stock in forest (tons/ha)
- 11.CT.2 Proportion of bodies of water with good ambient water quality
- 11.CT.3 Level of water stress: freshwater withdrawal as a proportion of available freshwater resources

2.4 Rationale for an accounting approach to compiling indicators

Policy- and decision-makers are increasingly seeking robust information on the state of nature and the contributions of nature to people and the economy. SEEA Ecosystem Accounting was developed as a measurement system to provide this information and support more integrated decision-making that recognises the relationships between people, nature and the economy.

Accounting approaches are used in a range of contexts, including for national economic accounts based on the System of National Accounts (SNA) and environmental-economic accounts based on the SEEA. A familiar headline indicator derived from national accounts is Gross Domestic Product (GDP). SEEA Ecosystem Accounting has the potential to support the derivation of ecosystem-related indicators, such as GBF Indicators A.2 and B.1, that are coherent and consistent across countries and over time, and that gain similar status to key widely used economic indicators. See Chapter 14 of SEEA Ecosystem Accounting for more detail on its role in relation to indicators. Further guidance on using the SEEA for calculating selected SDG indicators, alongside other indicators, is also available here.

Key features of the accounting approach include a focus on *clear and consistent definition of the concepts* that are the focus of measurement in the accounts. This allows for the use and organisation of data from multiples sources (the base of the pyramid in Figure 2), often developed by experts in specific subject matter areas, to estimate these concepts as best as possible. Suppliers of data are often involved in the process to ensure that estimates are meaningful. Because of the focus on consistent and stable concepts, the accounting approach allows for changes in source data and evolution of measurement methods and compilation approaches over time, while nevertheless maintaining a coherent and meaningful time series of accounts and indicators (Obst, 2019).

Accounts *organise information systematically using account tables* that have a standard structure and are based on standard concepts, frameworks and classifications (the middle two layers of the

pyramid in Figure 5. *Classifications* related to the concepts being measured play a central role in organising data from a range of sources consistently and coherently. A range of indicators can then be derived from the account tables (the top of the pyramid), providing consistent information that enables comparison over time and across countries.

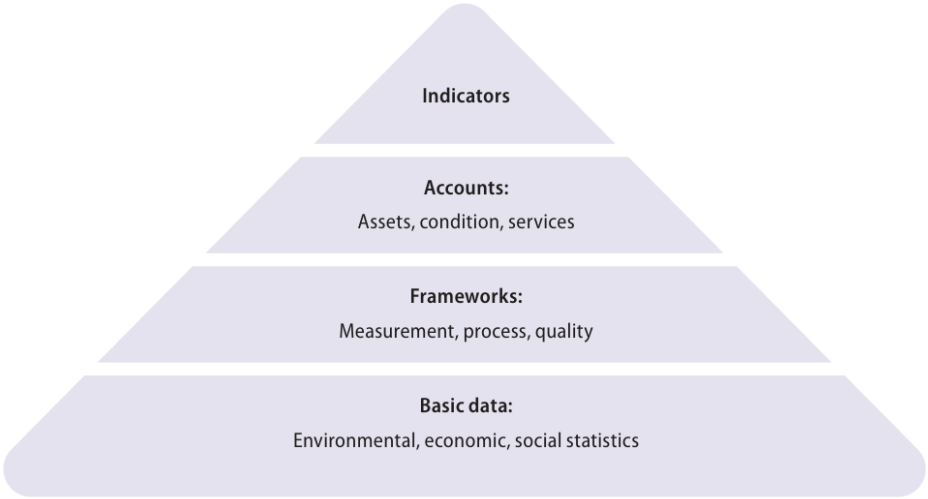

Figure 5. The information pyramid, showing the relationship between data, accounts and indicators.

(Source: Figure 14.1 in SEEA Ecosystem Accounting)

Using an accounting approach to organising data also helps to clearly and systematically identify data gaps over space and time, which can then be addressed iteratively to improve the reliability of the estimates of the concepts being measured.

An important consequence of this approach is that comparability among different estimates of the concepts being measured across time and between countries is not assessed primarily based on the data or specific measurement methods. Rather, comparability is based on the extent to which different estimates accurately reflect the concept(s) being measured, and the consistent organisation of data in standard account tables. *This means that data sources and methods may evolve over time within a country, and that different countries may use different data sources and methods, while still producing accounts and indicators that are comparable*. This is especially important in the context of global headline indicators, where it would be both unrealistic and inappropriate to insist that all countries use exactly the same data and methods in compiling the indicators.

Accounting distinguishes between *stocks and flows* (for example, stocks of ecosystem assets that provide flows of ecosystem services), which are measured separately but can be conceptually linked. In the case of ecosystem accounting, this enables consistency and coherence between measurement of ecosystems themselves, as illustrated by Indicator A.2, and the services that flow from them, as illustrated by Indicator B.1.

The SEEA Ecosystem Accounting framework is *comprehensive*, accounting for all ecosystem types and a wide range of ecosystem services though a set of five core accounts, shown in Figure 6, intended to be compiled regularly for consecutive accounting periods. This enables ecosystem

accounts to support detailed analysis of changes in the extent and condition of ecosystems and the ecosystem services that flow from them. The comprehensiveness of the accounts means they can support multiple reporting requirements in a coherent manner.

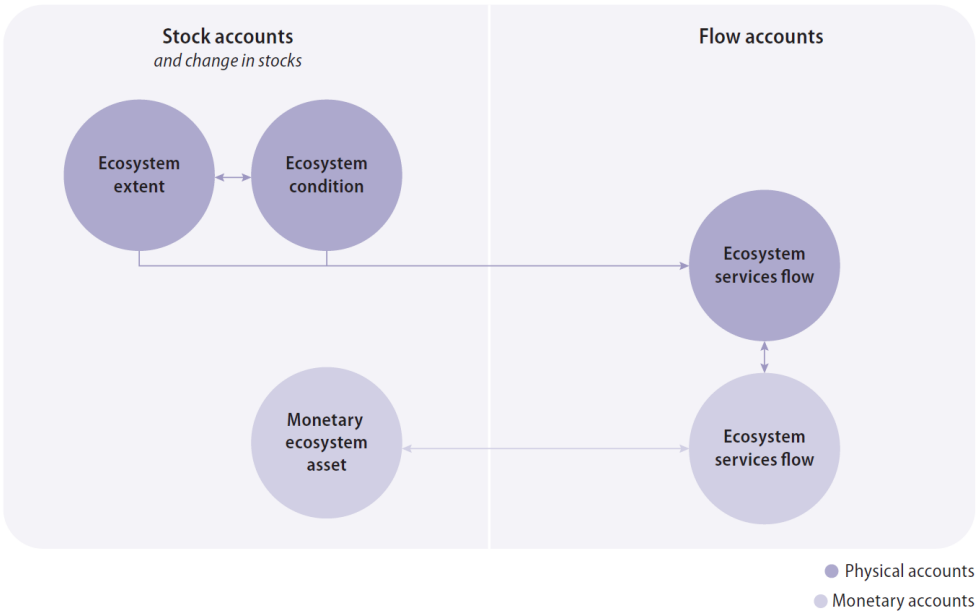

Figure 6. The five interconnected ecosystem accounts within SEEA Ecosystem Accounting provide a comprehensive and coherent view of ecosystems

(Source: SEEA Ecosystem Accounting, Figure 2.2)

Spatially detailed accounting, which is encouraged in SEEA Ecosystem Accounting, enables consistency from local to national to global levels, supporting coherence in planning and decision-making across different scales. In addition, the *alignment of SEEA with accounting principles used in the SNA* allows for integration of information about ecosystems with information about the economy.

CBD Decision 15/5 adopting the GBF monitoring framework explicitly notes "the value of aligning national monitoring with the United Nations System of Environmental-Economic Accounting statistical standard in order to mainstream biodiversity in national statistical systems and to strengthen national monitoring systems and reporting as appropriate and according to their national priorities and circumstances." For Indicator B.1, this alignment is achieved through the ecosystem services accounts of the SEEA Ecosystem Accounting framework, which record ecosystem service flows for each accounting period.

As highlighted above, organising and filtering basic data through the accounting framework can improve the consistency, comparability and comprehensiveness of indicators and support more robust monitoring and reporting. The role of SEEA Ecosystem Accounting is also to integrate those ecosystem data so as to enable a coherent and unified understanding of ecosystems and their relationship to the people and the economy. This has a wide range of applications in policy, planning and decision-making, over and above providing policy-relevant indicators, and supports mainstreaming biodiversity into social and economic development processes.

2.5 Interpreting Indicator B.1

Indicator B.1 provides an important measure of changes in ecosystem service flows and, therefore, in nature's contributions to people. An increase in the value of the indicator over time reflects an increase in the flows of ecosystem services included in the indicator relative to the base year of the indicator. Conversely, a decrease in the value of the indicator over time reflects a decrease in the flows of those ecosystem services relative to the base year.

As previously highlighted, the aggregation of trends in flows of multiple ecosystem service *can mask differences and possible trade-offs in trends of different ecosystem services*. This is mitigated to a degree by compiling sub-indices for the broad categories of provisioning, regulating and cultural ecosystem services. However, it is also an important consideration for individual ecosystem services within these broad categories. For instance, the trends in individual services of key policy concern may be masked by trends in the other services selected for each broad ecosystem service category. Accordingly, when reporting this indicator nationally countries may wish to draw attention to trends in specific ecosystem services that are counter to the overall trend, either positively or negatively.

The comprehensiveness of Indicator B.1 will be *strongly influenced by the number of ecosystem services selected to be included* in the indicator by countries. As discussed in Section 6, countries may initially select a small number of services for the indicator, working towards including a greater number over time as data availability and methods advance. Especially in earlier iterations of the indicator, it will likely reflect trends in those ecosystem services that are better known and for which data is most readily available.

A further limitation is that Indicator B.1 *does not reflect historical trends in ecosystem services prior to the base year* for which the indicator is calculated. An increase since the base year could be to a level that is nevertheless lower than the historical level in absolute terms, and a decrease relative to the base year could be to a level that is nevertheless higher than the historical level in absolute terms. This limitation should be highlighted in reporting and interpreting the indicator.

As noted in Section 2.2 on the rationale for Indicator B.1, the relationship between biodiversity and ecosystem services is complex. *An increase in the value of Indicator B.1 may not imply positive outcomes for biodiversity; equally, a decrease in the value of Indicator B.1 could be associated with positive outcomes for biodiversity*. Natural ecosystems in good condition and with greater species richness are not always linked to greater flows of ecosystem services, although they are often linked to a more varied set of ecosystem services flows.

Human activities associated with ecosystem service flows can generate pressures on ecosystems, impacting negatively on ecosystem condition and biodiversity. This applies for provisioning, regulating and cultural ecosystem services, and may be the case even for ecosystem services that are being sustainably used. An increase in ecosystem service flows could be the result of land-use change in which natural ecosystems are converted to anthropogenic ecosystems (for example, expansion of intensive agriculture could result in increased flows of crop provisioning and pollination services). This means that an increase in the value of the indicator could be accompanied by increased pressures on ecosystems and biodiversity and declines in ecosystem extent and condition.

Equally, decreases in the indicator could reflect reduced pressures on ecosystems and biodiversity, such as declining pollution or reduced harvesting rates. This reinforces the need to view Indicator B.1 alongside other indicators that directly reflect the state of biodiversity, such as Indicators A.1 Red List of Ecosystems and A.3 Red List Index for species.

Indicator B.1 *does not provide information about the drivers of change* in ecosystem service flows. For example, changes in ecosystem service flows are not necessarily related to changes in the extent or condition of the ecosystem supplying the service (i.e., ecological factors determining supply). They could be related to societal factors determining demand for the service. For example, an increase in coastal protection services may reflect increasing coastal population rather than changes in coastal ecosystems, or a decline in air filtration service flows may occur when ambient pollution falls due to emission control policy delivering a positive environmental outcome. Neither of these examples reflect changes in ecosystem extent or condition. As such, trends in ecosystem service flows depend partly on society's changing needs, and contextual demographic and environmental information is thus important for interpreting Indicator B.1

As noted in Section 2.2, Indicator B.1 *does not directly provide information about the sustainability of ecosystem service flows*. Ecosystem services accounts simply record the quantity of the ecosystem service that was supplied and used in a particular period, as explained further in Section 3.4. Some ecosystem services can be overused, if the ecosystem service flow exceeds regeneration rates (for example, for wild harvesting of species), absorption rates (for example, for removal or harmful pollutants), or carrying capacity of the underlying ecosystem. Additional information, over and above ecosystem services accounts, is needed to assess whether the use of an ecosystem service has exceeded sustainability thresholds. As discussed in Section 7.4, countries are encouraged to flag those ecosystem services included in Indicator B.1 that are currently unsustainably used, to provide additional information that can be reported alongside the indicator. This limitation is particularly important as current ecosystem service flows may not reflect the long-term capacity of ecosystems to sustain contributions to human wellbeing over time and for future generations.

Indicator B.1 does not in itself provide information about *who has access to ecosystem services or how access is distributed*, for example between low-income and high-income households. It also does not give insight into ecosystem service flows per capita, as ecosystem services accounts record total use of an ecosystem service, not per capita use, and the total flow of an ecosystem service might increase while the per capita quantity declines. However, per capita values could be derived from ecosystem accounts combined with demographic data and could reveal useful information for informing national policy. This is an example of how the accounts underlying the indicator can have a range of applications, broader than the indicator itself, as mentioned in Section 2.4 on the accounting approach.

There is thus always a need for caution in interpreting ecosystem services measurement, assessment, accounts or indicators from a biodiversity and human wellbeing perspective. This reinforces the importance of careful selection of the ecosystem services for inclusion in Indicator B.1, discussed in Section 6, so that it is consistent as possible in communicating the intent of Goal B and the GBF vision of a world living in harmony with nature.

3 Concepts and definitions relevant to the indicator

Key concepts that underpin Indicator B.1 include ecosystems, ecosystem types, ecosystem services and ecosystem service flows. Ecosystem services and ecosystem service flows have specific definitions in an accounting context, which are introduced here with more detail available in Chapter 6 of SEEA Ecosystem Accounting. Related concepts include ecosystem extent, ecosystem condition, and natural and anthropogenic ecosystem types, discussed briefly here and further elaborated in the Compilation Guidelines for Indicator A.2.

For Indicator B.1 to be comparable between countries and over time, it is essential that these concepts are defined clearly and used consistently in all countries. As highlighted in Section 2.4 on the accounting approach, if the concepts that form the basis for measurement of an indicator are well defined and consistent, the data and methods used can evolve over time within a country and vary between countries while still allowing for an indicator that is meaningful and comparable across contexts and through time. Clear and consistent concepts allow for flexibility in how they are operationalised, including in data sources and measurement methods.

3.1 Ecosystem

An ecosystem is defined by the CBD as a dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit (United Nations, 1992). Important elements of this definition are the biotic (living) component, the abiotic (non-living) component and the interactions among the biota and between the biotic and abiotic components.

Alongside this definition, three attributes of ecosystems are often identified: composition, structure and function (Noss, 1992). Composition relates to the suite of species that occur within the ecosystem, structure to the physical structure and patterns of the ecosystem, and function to ecological processes.

3.2 Ecosystem type

For many real-world applications, it is useful to divide the ecosystems that occur in a continuous landscape or seascape into different ecosystem types that can be used for assessment, accounting, planning, decision making, management and monitoring (Keith et al., 2015). An ecosystem type is defined as a type of ecosystem distinguished from other types by its characteristic functional, structural and compositional properties (IUCN, 2025), and is typically identified and delineated as part of a hierarchical classification system, based on biotic and abiotic factors.

An ecosystem type need not be contiguous in the landscape; it typically consists of several or many occurrences interspersed with occurrences of other ecosystem types. In SEEA Ecosystem Accounting these occurrences are called *ecosystem assets*, defined as contiguous spaces covered by a specific ecosystem type characterised by a distinct set of biotic and abiotic components and their

interactions (paragraph 2.11). See the Compilation Guidelines for Indicator A.2 for more detailed discussion of the concept of an ecosystem type.

Ecosystem types are the building blocks for national ecosystem maps (see Section 7.1.2), and, when cross-referenced to the Global Ecosystem Typology, allow national classifications to be compared and aggregated globally. See *Guidelines for Developing National Ecosystem Maps* (Global Ecosystems Atlas, 2026, especially Section 2), for more on national ecosystem maps.

3.3 Ecosystem services

Ecosystem services are defined in SEEA Ecosystem Accounting as "*the contributions of ecosystems to the benefits that are used in economic and other human activity"* (paragraph 2.14). A clear conceptual boundary is drawn between the ecosystem service (the contribution of the ecosystem to the final benefit) and the benefit (the good or experience used or enjoyed by people). The production of the benefits in many cases involves human inputs, such as labour, infrastructure and technology, in addition to the inputs provided by ecosystems.

The distinction between the ecosystem contribution and human inputs is important for the measurement of ecosystem services for accounting, where the intention is to measure and account for just the ecosystem contribution to the benefit, and not to use the whole benefit as a proxy in measuring the ecosystem service. In practice, this is more challenging for some ecosystem services than others. For example, marine ecosystems contribute to the growth of fish populations, which forms the ecosystem service *wild fish biomass provisioning*. However, the benefit of landed fish is realised only when this ecosystem contribution is combined with human inputs such as boats, fishing gear, labour and the skills needed to locate, catch and land the fish. Similarly, ecosystems contribute to the growth of cultivated plants, which forms the ecosystem service *crop provisioning*. However, the harvested crop reflects both the ecosystem contribution and human inputs such as machinery, labour, irrigation and nutrient inputs.

SEEA Ecosystem Accounting also makes a distinction between *intermediate and final ecosystem services*. Final ecosystem services are ecosystem contributions that flow directly to, and are used by, economic units (households, businesses or government) in the production of benefits (e.g., the fish landed by fishing businesses or the harvested crops in the previous examples). Intermediate ecosystem services are defined as those ecosystem services in which the user of the ecosystem service is an ecosystem asset rather than an economic unit and where there is a connection to the supply of final ecosystem services used by economic units. Intermediate ecosystem services are often closely associated with ecosystem functions (referred to in Goal B). For example, seagrass meadows may provide nursery population services by providing sheltered, food rich habitats for juvenile fish before they move to adult habitats. In this case, the nursery population service is treated as an intermediate service supplied by the seagrass meadow ecosystems to other marine ecosystems, while the wild fish biomass provisioning service is final service provided by the marine ecosystems from which adult fish are harvested.

Intermediate ecosystem services contribute to services provided by other ecosystems, whereas final ecosystem services contribute directly to benefits used by people in economic or other human

activities. In ecosystem accounting, the focus is usually on accounting for final ecosystem services only, although there are instances in which accounts are compiled for intermediate services, such as pollination services, soil quality regulation services and nursery population services.

3.4 Ecosystem service flows

In ecosystem accounting**,** ecosystem services are understood as actual flows between ecosystem assets (the individual occurrences of ecosystems that supply services) and the economic units that use the services (such as households, businesses, or governments). This framing emphasises that an ecosystem service exists only when there is a *realised* interaction: the ecosystem supplies a service —like purified water, wild harvested species, or recreation opportunities—and a user actually receives or uses that service. This aligns with the accounting principle that the flows that are realised are recorded; potential or unused ecosystem contributions to people and the economy are *not* recorded in ecosystem services accounts. An example is water flood regulation services provided by wetland ecosystems. An ecosystem service flow should be recorded in cases where wetland ecosystems occur in or upstream from a catchment in which people live or economic activity takes place. In this scenario, these people and economic activities are protected from flood risk by the wetland's ability to moderate water flows during high rainfall events. If there are no people of economic activities in or downstream of the catchment where the wetlands occur, there is no use of the ecosystem service and no ecosystem service flow.

Because SEEA Ecosystem Accounting treats ecosystem services as transaction-like flows, each service must reflect the fundamental accounting requirement that *supply matches use*. The ecosystem is recorded as the supplier of the service, and an economic unit is recorded as the user, with quantities equal on both sides. This approach ensures internal consistency within the accounts and allows ecosystem services to be integrated with economic accounts based on the System of National Accounts.

The accounting approach of recording the actual flow of an ecosystem service also means that flows are recorded irrespective of whether they are sustainable in the longer term. The implications of this for interpreting Indicator B.1 were highlighted in Section 2.5 and an approach to flagging unsustainable flows is discussed in Section 7.4.

As ecosystem service flows are defined in relation to actual use or realised contributions, they primarily capture instrumental contributions of ecosystems to human wellbeing. They do not fully reflect relational values and do not represent intrinsic values associated with nature.

3.5 Ecosystem extent

Ecosystem extent is defined in SEEA Ecosystem Accounting as the size of an ecosystem asset, where ecosystem assets are defined as contiguous spaces of a specific ecosystem type characterised by a distinct set of biotic and abiotic components and their interactions (paragraph 2.13). As discussed above, an ecosystem type may have several occurrences, i.e. be made up of several ecosystem assets. The combined extent of all these ecosystem assets or occurrences makes up the overall extent of the ecosystem type.

3.6 Ecosystem condition

Ecosystem condition is defined in SEEA Ecosystem Accounting as the quality of an ecosystem measured in terms of its abiotic and biotic characteristics. Condition is assessed with respect to an ecosystem's composition, structure and function which, in turn, underpin the integrity of the ecosystem (paragraph 5.2).

The term ecosystem integrity as used in the GBF represents the same concept as ecosystem condition. The term ecosystem degradation is used in some contexts, such as in the Red List of Ecosystems, to communicate a loss of integrity or decline in ecosystem condition. In the context of SEEA Ecosystem Accounting, degradation refers to a decline in the value of an ecosystem asset linked to a decline in future flows of ecosystem services from that asset. To avoid potential confusion, the term degradation is avoided in discussing ecosystem condition in these guidelines.

In general, *ecosystem condition will not be uniform across the whole area of an ecosystem type*. Rather, a spectrum of ecosystem condition states may exist across its range. Ecosystem condition is assessed in part based on compositional, structural and functional characteristics, often focusing on how far these depart from a reference level associated with good ecological condition for that ecosystem type. The same ecosystem characteristics that are used to classify ecosystem types are also often used in assessing condition within the distribution of that ecosystem type.

3.7 Natural and anthropogenic ecosystem types

Indicator A.2 Extent of natural ecosystems requires a clear distinction to be made between natural and anthropogenic ecosystem types. For Indicator B.1, the distinction helps to inform the selection of ecosystem services to be included, discussed in Step 1 Deciding on measurement scope (Section 6). For coherence across the two indicators, it is important that consistent definitions are used.

Natural ecosystem types represent a broad category of ecosystems that include:

(a) *Ecosystems influenced or modified by human interventions, but with natural compositional, structural and functional characteristics still at least partially present and recognisable*. The human interventions could be beneficial, neutral or negative from a biodiversity perspective. In some cases, the human intervention may mimic processes that would have taken place as part of the natural functioning of the ecosystem prior to human modification (e.g. grazing by wild herbivores or natural fire cycles). It may include the use and management of ecosystems by traditional and/or Indigenous societies, including practices such as fire management, nomadic grazing and other pastoral practices that in some countries have been in place for many thousands of years. In some contexts, these modified natural ecosystems are termed semi-natural.

(b) *Instances or occurrences of natural ecosystem types that are in a range of condition states*, from pristine ecosystems in excellent condition or with high integrity, through to those in poor condition or with low integrity.

To emphasise, the concept of a natural ecosystem does not imply an ecosystem uninfluenced by humans, and recognises that virtually all ecosystems on Earth have been shaped to some degree by

human activity. A gradient of human influence, incorporating many human activities, is consistent with this broad definition of natural ecosystem types. There is also no implication that human intervention is always negative; indeed, it can include conservation and restoration actions.

Contrasted with natural ecosystem types, *anthropogenic ecosystem types are those created and maintained through human interventions*, i.e. human interventions are the primary determinant of the composition, structure and functioning of the ecosystem. An anthropogenic ecosystem type has typically replaced a pre-existing or antecedent natural ecosystem type, which is no longer recognisably present (although small patches/fragments and some native species may persist). Human intervention does much more than influence or modify the ecosystem, even substantially. It determines the compositional, structural and functional characteristics of the ecosystem (including biotic and abiotic components), and is typically essential for maintaining those characteristics.

The human interventions that create anthropogenic ecosystems are frequently connected to land- and sea-use systems that maintain modern-day industrial societies. The term “pre-existing or antecedent natural ecosystem type” is used in this context to mean existing before intensive human modification of the landscape. In most contexts, pre-existing can be interpreted to mean pre-industrial, coinciding with pre-colonial in some cases, with no need to specify a precise date. Pre-industrial does not imply pre-human, with full recognition that in many countries traditional and/or Indigenous settlement and management of natural ecosystems spans thousands of years.

Care should be taken not to confuse managed natural ecosystems or instances of an ecosystem type in poor ecological condition with an anthropogenic ecosystem type. Natural ecosystems can be substantially modified without being converted to an anthropogenic ecosystem type. See the Compilation Guidelines for Indicator A.2 for further discussion on the distinction between natural and anthropogenic ecosystem types, including examples, how to distinguish them in practice and discussion of borderlines cases.

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4 Classifications that underpin the indicator

Classifications that underpin the compilation of Indicator B.1 are the reference list of ecosystem services in SEEA Ecosystem Accounting, national ecosystem classifications and the Global Ecosystem Typology.

4.1 Reference list of ecosystem services in SEEA Ecosystem Accounting

SEEA Ecosystem Accounting includes a reference list of ecosystem services that supports accounting for a wide range of ecosystem services, grouped into the three widely used categories of provisioning, regulating and maintenance, and cultural services, as shown in Table 2. While not a formal classification, the reference list has been adopted as part of the SEEA Ecosystem Accounting international statistical standard. It was developed for statistical purposes as a blend of existing major ecosystem services classifications, in close consultation with their custodians. A correspondence table between the SEEA reference list and other ecosystem services classifications is available online.

Section 6.3 of SEEA Ecosystem Accounting includes a full discussion of the reference list, including a brief description of each ecosystem service in Table 6.3 (not reproduced here). The reference list is designed to be as comprehensive as possible. However, it is not intended to constrain countries to a fixed set of ecosystem services. For each broad category of ecosystem services, it includes an "other" sub-category that enables countries to incorporate additional ecosystem services that reflect their priorities, knowledge systems and policy needs. In this way, the reference list maintains global consistency while allowing flexibility for additional nationally relevant services to be included.

Table 2. The reference list of ecosystem services in SEEA Ecosystem Accounting

	SEEA code*
Provisioning services	
Crop provisioning	1.1
Grazed biomass provisioning**	1.2
Livestock provisioning**	1.3
Aquaculture provisioning	1.4
Wood provisioning	1.5
Wild fish and other wild aquatic biomass provisioning	1.6
Wild animals, plants and other biomass provisioning	1.7
Genetic material	1.8
Water supply	1.9
Other provisioning services	1.10
Regulating and maintenance services	
Global climate regulation	2.1
Rainfall pattern regulation (at sub-continental scale)	2.2
Local (micro and meso) climate regulation	2.3
Air filtration	2.4
Soil quality regulation	2.5

Soil erosion control	2.6
Landslide mitigation	2.7
Solid waste remediation	2.8
Water purification – retention and breakdown of nutrients	2.9
Water purification – retention and breakdown of other pollutants	2.10
Water flow regulation – baseline flow maintenance	2.11
Water flow regulation – peak flow mitigation	2.12
Flood control – coastal protection	2.13
Flood control – river flood mitigation	2.14
Storm mitigation (other than water-related storms)	2.15
Noise attenuation	2.16
Pollination	2.17
Biological control – pest control	2.18
Biological control – disease control	2.19
Nursery population and habitat maintenance	2.20
Other regulating and maintenance services	2.21
Cultural services	
Recreation related – nature-based tourism***	3.1
Recreation related – day-to-day recreation***	3.1
Visual amenity	3.2
Education, scientific and research	3.3
Spiritual, artistic and symbolic	3.4
Other cultural services	3.5

* The SEEA codes come from the cross-reference of the SEEA reference list to other ecosystem services classifications, available online.

** If grazed biomass provisioning is recorded as an ecosystem service, livestock provisioning should generally not be recorded separately, as this may result in double-counting. Grazed biomass is typically an input to livestock provisioning.

*** Recreation-related services are grouped as a single service in the SEEA reference list. However, nature-based tourism and day-to-day recreation have different users and are typically measured in different units, so they will generally be accounted for as separate services.

If a country has a national ecosystem service classification or uses a global classification that is different from the SEEA reference list, each ecosystem service that is selected by the country for inclusion in Indicator B.1 should preferably be cross-referenced to the SEEA reference list. This is important because the SEEA reference list of ecosystem services is used in the template for reporting Indicator B.1, to enable global aggregation of the indicator.

4.2 National ecosystem classifications

In addition to a classification of ecosystem services, ecosystem services accounts require a classification of ecosystem types, as the supply of each ecosystem service should be linked to one or more ecosystem types.

A national ecosystem classification distinguishes between different ecosystem types present in a country, preferably as part of a hierarchical classification system, and provides lists and descriptions of those ecosystem types. The classification is typically accompanied by spatial datasets or maps of

the distribution of the ecosystem types, with classification and mapping often taking place iteratively. Both the classification and spatial datasets on ecosystem types are foundational for ecosystem accounts.

Countries are at different stages of developing national ecosystem classifications and accompanying maps, with these resources well established in some countries but still at an early stage of development or not yet in place in others. See the Compilation Guidelines for Indicator A.2 (Section 7.1.1) for more on national ecosystem maps, and the *Guidelines for Developing National Ecosystem Maps* for further guidance (Global Ecosystems Atlas, 2026).

In practice, linking ecosystem services to specific ecosystem types can be challenging, as discussed further as part of Step 2 Collecting and organising key datasets (Section 7.3).

4.3 IUCN Global Ecosystem Typology

Also important for Indicator B.1 is the IUCN Global Ecosystem Typology (Keith et al., 2020; Keith et al., 2022), which is a hierarchical framework for identifying and classifying different ecosystem types across the terrestrial, subterranean, freshwater and marine realms and transitions between them. It enables global consistency at the upper levels of the Typology while encouraging detailed national ecosystem classifications at the lower levels (typically level 5 or 6). The Global Ecosystem Typology is the only globally applicable ecosystem-based classification that covers all realms. It is the reference classification for ecosystem types in SEEA Ecosystem Accounting and was endorsed as an international statistical classification by the UN Statistical Commission in 2024.

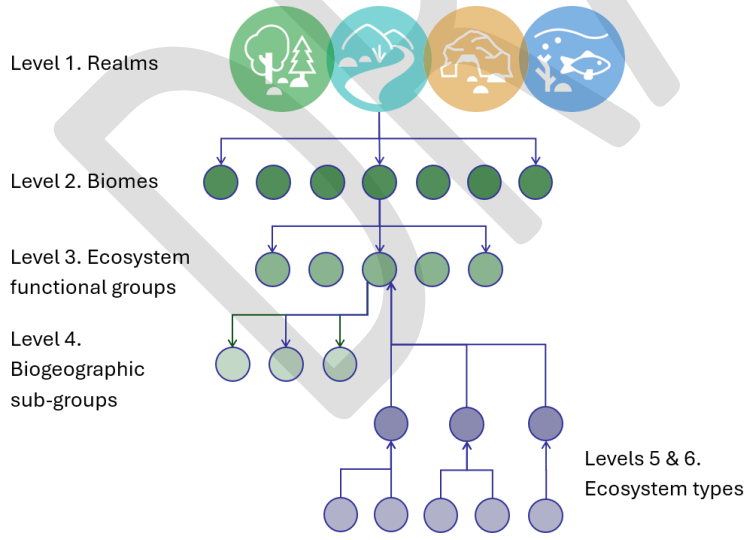

Figure 7. The Global Ecosystem Typology enables global consistency at the upper levels of the hierarchy (shown in realm icons and green circles) while encouraging detailed national ecosystem classifications at the lower levels (shown in purple).

(Source: Based on Xiao et al., 2024)

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The *Guidelines for Developing National Ecosystem Maps* (Global Ecosystems Atlas, 2026) provide a short introduction to the Global Ecosystem Typology, and the Global Ecosystem Typology website provides more detail, including descriptions of all biomes and ecosystem functional groups.

CBD Decision 16/31 on the monitoring framework includes the following text:

- "17. Encourages Parties … to take a consistent approach at the national level to monitoring ecosystems and reporting data across the goals and targets of the Framework, based on national ecosystem classifications;"
- "18. Invites Parties to make use of the Global Ecosystem Typology, or an equivalent methodology, and cross-reference their national ecosystem data with levels 2 and 3 of that typology, subject to national circumstances and capabilities;"

A CBD information document (CBD/COP/16/INF/3/Rev.1) provides guidance on using the indicators of the monitoring framework of the GBF, including Section 2b titled "Using a consistent ecosystem classification to support the monitoring framework of the Kunming-Montreal Global Biodiversity Framework based on the IUCN Global Ecosystem Typology". It encourages disaggregation of ecosystem-related GBF indicators to level 3 of the Global Ecosystem Typology rather than to level 2 (biomes), and explains the strengths of this option. Level 3 helps to differentiate ecosystem groups by the biodiversity they support, the benefits they provide, the pressures and threats they face and thus actions needed. It provides appropriate resolution to support the objectives and information requirements of the GBF, compared with the biome level, which often obscures important information about biodiversity and may not provide enough detail to be meaningful from a biodiversity perspective.

Consistent reporting on ecosystems at level 3 of the Global Ecosystem Typology, across all the ecosystem-related GBF headline indicators, will enable the causal links across the GBF to be tracked and progress to be monitored effectively. In addition, it provides the flexibility to report the ecosystem-related indicators by biome (level 2) or realm (level 1), as ecosystem functional groups are nested within biomes, which are nested within realms.

Countries are thus encouraged to cross-reference their national ecosystem classifications to ecosystem functional groups (level 3) in the Global Ecosystem Typology. This is best linked to the process of developing or refining a national ecosystem map, and is supported by the IUCN's *Standards, methods and guidelines for cross-referencing ecosystem classifications and maps to the IUCN Global Ecosystem Typology* (IUCN, 2025).

It is important to emphasise that the Global Ecosystem Typology does not replace national ecosystem classifications. Rather, it provides a way of linking national ecosystem classifications to a consistent global system that allows ecosystem information to be compared across countries and regions and synthesised at the global level. The intention is that ecosystem accounts should be compiled using national ecosystem classifications, with the Global Ecosystem Typology used for the purpose of global reporting. However, as an interim measure for countries that have not yet linked the supply of ecosystem services to national ecosystem types, there is the option of linking them directly to ecosystem functional groups in the Global Ecosystem Typology or to biomes as a second-best option, as discussed in Section 7.3.

PART B. DEVELOPING THE INDICATOR

This part of the guidelines sets out the process for compiling and reporting on Indicator B.1 and discusses specific compilation issues that may arise. Compilation of the indicator can be approached as a stepwise process, summarised in Figure 8, recognising that there will be iteration between the steps rather than a strictly linear process. Several of the steps are supported by complementary resources to these guidelines, which are described briefly in Section 11.

Figure 8. Summary of the stepwise approach to developing Indicator B.1, highlighting complementary resources to the Compilation Guidelines

The compilation of Indicator B.1 requires contributions from multiple institutions, including those responsible for ecosystem service measurement and modelling, ecosystem mapping, environmental accounting and national reporting, as well as sectoral agencies and research institutions that develop and maintain datasets related to ecosystem service flows. Early and sustained collaboration between these institutions is therefore a critical success factor. While the specific institutional arrangements will differ among countries, Step 0 Preparation outlines key considerations for establishing an effective collaborative process from the outset.

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5 Step 0. Preparation

Step 0 is the preparation phase for developing Indicator B.1. It should be used to establish the institutional arrangements and technical team. Because Indicator B.1 is derived from ecosystem services information and relies on ecological and socio-economic interpretation as well as statistical compilation, it is best approached as a collaborative process involving the environment ministry, the national statistical office, national technical entities with relevant mandates, and other relevant scientific, research and technical partners.

Countries should begin by bringing together the key institutions, experts and other knowledge holders who will contribute to compilation and use of the indicator. This may include ecosystem scientists, environmental economists, ecosystem accounting specialists, carbon accounting experts, geospatial analysts, hydrologists, sectoral specialists (e.g. forestry, fisheries, agriculture and water), Indigenous and local knowledge holders, and custodians of key datasets used to quantify ecosystem service flows. Early collaboration is particularly important where the expertise needed to develop national datasets on ecosystem services is distributed across several institutions, to avoid facing delays in later steps. Identifying these contributors at the outset will help ensure that the indicator is ecologically and socio-economically meaningful, technically robust and understood by both compilers and users.

A national self-assessment should be carried out to identify available datasets, capacity and gaps. This assessment should include a review of whether national or subnational ecosystem service datasets exist, whether they are consistent with the accounting approach to measurement of ecosystem service flows, and whether ecosystem services accounts have already been compiled. It should consider the spatial and temporal coverage, scale, date of update, validation status, data sources and custodianship of each dataset. It should also identify any key datasets that will need to be developed or improved before Indicator B.1 can be compiled reliably.

The preparation phase should also be used to coordinate with teams responsible for related ecosystem indicators and reporting processes, including other GBF headline indicators. This coordination can help avoid duplicated effort, reduce the risk of inconsistent classifications, and strengthen the case for investing in shared foundational datasets such as national ecosystem maps.

Finally, countries should establish documentation practices from the beginning of the compilation process. Technical documentation should record definitions used, classification and cross-referencing decisions (including their rationale), data sources, spatial scale, methods, assumptions, and validation steps, with particular attention to any methodological changes between reporting periods and their implications for interpretation of the indicator. Maintaining this information throughout the process is essential for transparency, comparability across time, and the institutionalisation of regular indicator compilation.

The SEEA Ecosystem Accounting Implementation Guide provides further guidance to support implementation of ecosystem accounting at the national level, including strategic planning, building mechanisms for implementation and compiling the accounts, with country examples.

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6 Step 1. Deciding on measurement scope: selecting ecosystem services for inclusion in the indicator

In the context of Indicator B.1, measurement scope refers primarily to the *set of ecosystem services selected to be included in the indicator*. The metadata for the indicator gives broad guidance on factors to be considered in selecting ecosystem services, including direct contribution to human wellbeing, compatibility with the overall intent of the GBF, national importance or policy relevance of the services, and data availability. In addition, a blended approach reflecting both national and global priorities is recommended. Here the guidance in the metadata is developed further, to provide a sequential framework to guide the selection process. Guidance on the number of services to be included in the indicator at the national level is also provided.

As a starting point, the *purpose and rationale for the indicator, discussed in Section 2.2, should inform the selection of ecosystem services*, and services that are not consistent with the rationale should not be included in the indicator. Selection of ecosystem services should not be driven in the first instance by data availability or feasibility of measurement, but rather by a clear and defensible rationale, supported by considerations of data availability and feasibility of measurement. This is important to ensure that the services included in the indicator reflect its intended purpose and the goals of the GBF, rather than simply those for which data and measurement methods happen to be available.

Wherever possible, the reference list of ecosystem services in SEEA Ecosystem Accounting should be used as a starting point for selecting ecosystem services. As discussed in Section 4.1, countries that have a national ecosystem service classification are encouraged to cross-reference their national classification to the SEEA reference list.[3] Ecosystem services identified nationally that cannot be cross-referenced to any of the services in the SEEA reference list can be added to the list, which has several "other" classes to accommodate additional ecosystem services. This is important because the SEEA reference list of ecosystem services is used in the template for reporting the indicator, to enable global aggregation of the indicator.

The metadata requires that all three broad categories of ecosystem services should be represented in the indicator, enabling disaggregation of the indicator into the three sub-indices for provisioning, regulating and cultural services. As discussed, trends in these three sub-indices often differ and may be masked by the trend in the overall index.

The metadata requires that all countries should include global climate regulation services (carbon sequestration and storage by ecosystems)[4] in the indicator, because of its universal importance. This service benefits all people across the globe regardless of where the service is generated.

[3] To support this, a correspondence table between the SEEA ecosystem services reference list and several other ecosystem service classifications is available here: https://seea.un.org/ecosystem-accounting/

[4] Global climate regulation services are defined in SEEA Ecosystem Accounting (Table 6.3) to include removal (sequestration) and retention (storage) of carbon from the atmosphere by ecosystems.

Building on these starting points, the sequential framework for selecting ecosystem services for the indicator has two stages, summarised in Figure 9 and discussed further below:

- First, *prioritise* ecosystem services from the SEEA reference list based on two dimensions central to the rationale for the indicator: direct contribution to human wellbeing, and compatibility with the conservation and sustainable use of biodiversity,
- Next, consider a combination of national importance, the need to represent all three broad categories of ecosystem services, and feasibility of measurement, to *select* a set of ecosystem services from among those prioritised.

The process of prioritising and selecting ecosystem services for the indicator should consider national context, scientific evidence, and Indigenous and local knowledge. It may benefit from engagement with community-based monitoring initiatives and local knowledge holders, particularly where ecosystem services are strongly linked to local livelihoods, territorial management, cultural practices or relational values.

Ecosystem services that are not prioritised in the first stage should not be reintroduced for consideration in the second stage. The first stage thus serves as a filter to exclude some ecosystem services from the indicator, based on poor alignment with the rationale for the indicator. Even if existing accounts or methods and data are available for these ecosystem services, they should not be included in the indicator.

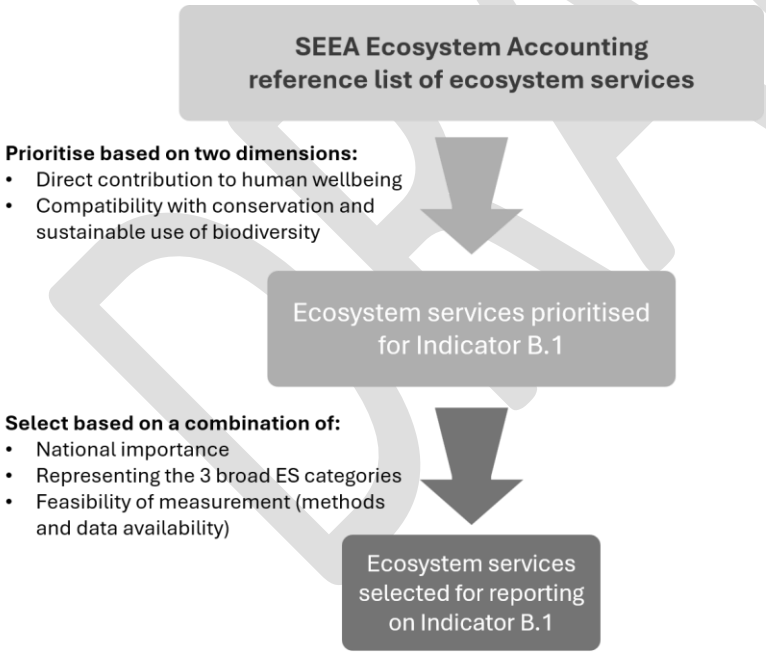

Figure 9. A sequential framework for selecting ecosystem services for inclusion in Indicator B.1 at the national level

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6.1 First stage: Prioritise ecosystem services based on two overarching dimensions

Two dimensions are relevant here, drawing directly from the rationale for the indicator. Ecosystem services should be evaluated against both dimensions rather than just one or the other. A "yes" for both dimensions is required for an ecosystem service to be considered in Stage 2.

Dimension A: Does the ecosystem service contribute directly to human wellbeing in the national context, recognising that contributions to human wellbeing may be understood differently across societies, cultures and knowledge systems?

Specific question that may be useful to consider include:

- Does the ecosystem service safeguard people from environmental risks (including related to climate change) and protect their health?
- Does the ecosystem service provide benefits to many people?
- Do vulnerable groups (such as low-income households, children and youth, women and girls) depend on the ecosystem service, including for their livelihoods and economic survival?
- Is the ecosystem service significant for Indigenous Peoples and local communities, including from a social and cultural perspective?

There may be statistical or other quantitative evidence available to inform assessment of these questions, for example relating to the number of people who benefit from an ecosystem service or its importance for livelihoods and wellbeing. Where such evidence is available, it should be used to support the assessment. In the absence of suitable quantitative information, expert judgement can be applied, drawing where possible on a range of relevant expertise and knowledge systems.

Ecosystem services for which the answer to any of these questions is "yes" are likely to align well with the rationale for the indicator. For global climate regulation services, the answer to the first question is a clear "yes" and a great many people around the world benefit from the service.

Dimension B: Is the ecosystem service compatible, at least in principle, with the conservation and sustainable use of biodiversity?

This dimension is particularly important if the indicator is to be meaningful as the headline indicator for tracking progress in Goal B and consistent with the GBF vision of a world of living in harmony with nature.

Two cautionary signals in this regard are:

- *Where the supply of an ecosystem service is typically associated with major direct drivers of biodiversity loss*, such as conversion from natural to anthropogenic ecosystem types, it is unlikely to be compatible with the rationale for the indicator. Examples are crop provisioning services associated with conversion of natural ecosystems to croplands, wood provisioning from timber plantations, and grazed biomass provisioning from sown pastures.
- *Where the contribution of the ecosystem to the benefit associated with the service is small relative to the contribution of human inputs*, the ecosystem service is less likely to be compatible with the rationale for the indicator. Almost all benefits associated with ecosystem services

require some form of coproduction that combines the contribution of the ecosystem with human inputs, so the balance of these contributions needs to be considered. For example, most crop provisioning services require substantial human inputs (such as capital, labour, nutrient inputs) to produce the benefit that is enjoyed by economic units. Wood provisioning from timber plantations is a similar case.

These cautionary signals are most often, although not exclusively, associated with provisioning services supplied by anthropogenic ecosystem types. Such ecosystem services would in most contexts be poorly aligned with the rationale for Indicator B.1 and thus excluded from the indicator. A strong case to the contrary would be needed to prioritise them for selection.

In practice, ecosystem services supplied by natural ecosystem types (defined broadly to include modified natural ecosystems), are more likely to be well suited to Indicator B.1 than those supplied by anthropogenic ecosystem types. This includes provisioning services from natural ecosystem types and many regulating and cultural ecosystem services. An exception for anthropogenic ecosystem types may be ecosystem services supplied by natural elements within them, such as natural parks or rivers within urban areas, which can provide important regulating and/or cultural services and often contribute to Nature-based Solutions to a range of societal challenges.

Ecosystem services that are compatible in principle with the sustainable use of biodiversity may not always be used at sustainable levels in practice. An approach to dealing with this issue is discussed in Section 7.4, which recommends flagging those ecosystem services for which flows are considered to be unsustainable. Ecosystem services should not be excluded from the indicator based only on currently unsustainable flows, provided that sustainable flows could be achieved in principle.

Table 3 provides some considerations for assessing provisioning services in the SEEA reference list against the dimensions for inclusion of ecosystem services in the indicator. These are intended as indicative considerations that countries could use as a starting point and should not be seen as a substitute for evaluation of each ecosystem service in the national context. If quantitative evidence to support the assessment is available it should be used; alternatively, expert judgement can be applied, drawing where possible on a range of relevant expertise and knowledge systems.

Table 3. Considerations for assessing alignment of provisioning services from the SEEA reference list with dimensions for prioritising ecosystem services for inclusion in Indicator B.1

	Considerations for assessing compatibility with conservation and sustainable use of biodiversity	**Indicative alignment with rationale for Indicator B.1**
Crop provisioning	In most cases this service is associated with anthropogenic ecosystem types, with large human inputs relative to the ecosystem contribution. The supply of this service can be associated with the conversion of natural ecosystems to croplands. In these scenarios, the use of this service is unlikely compatible with the sustainable use of biodiversity. In some cases, crop production can take place within modified natural ecosystems, where it may have greater potential to be compatible with the conservation and	Typically poorly aligned

	Considerations for assessing compatibility with conservation and sustainable use of biodiversity	Indicative alignment with rationale for Indicator B.1
	sustainable use of biodiversity than is typically the case in cropland ecosystem types.	
Grazed biomass provisioning	A key distinction for this service is between biomass supplied by natural ecosystem types and biomass supplied by anthropogenic ecosystem types. Rangelands as a land use are associated with the wide array of natural ecosystem types, including modified natural ecosystems. Many of these ecosystem types evolved with grazing integral to ecosystem functioning, and their use as rangelands is compatible with conservation and sustainable use of biodiversity if appropriately managed within carrying capacities (see discussion in Section 7.4 on how unsustainable ecosystem service flows can be flagged in reporting the indicator). Human inputs are typically low relative to the ecosystem contribution. Users of the service may include vulnerable groups such as subsistence farmers and pastoral communities. In contrast, sown pastures often replace natural ecosystem types, and large human inputs are typically combined with the ecosystem contribution to produce the benefit (livestock). In these scenarios, the use of this service is unlikely compatible with the conservation and sustainable use of biodiversity.	May be well aligned for biomass from natural rangelands; typically poorly aligned for biomass from intensive pastures
Livestock provisioning	As with grazed biomass, a key distinction for this service is whether the livestock are raised primarily in natural rangelands with low human inputs, or in sown pastures and/or feedlots with large human inputs.	May be well aligned for livestock from natural rangelands; typically poorly aligned for livestock from sown pastures or feedlots
Aquaculture provisioning	In many cases this service is associated with anthropogenic ecosystem types, with large human inputs relative to the ecosystem contribution. Depending on production practices and location, aquaculture may be associated with the conversion of natural to anthropogenic ecosystems and other pressures on biodiversity, for example through pollution, disease transmission or escapes of farmed species.	Often poorly aligned.
Wood provisioning	A key distinction for this service is between wood supplied by natural ecosystem types and wood supplied anthropogenic ecosystem types. Natural ecosystem types include managed and semi-natural forest ecosystems, in contrast with timber plantations, which are anthropogenic ecosystem types. The use of wood provisioning services from natural ecosystem types is compatible with conservation and sustainable use of biodiversity if appropriately managed (e.g., with harvests not greater than regeneration rates). Timber plantations often replace natural ecosystem types and often involve exotic species. The ecosystem contribution is typically combined with large human inputs to produce the benefit (timber). The use of wood	May be well aligned for harvesting of wood from natural ecosystem types; typically poorly aligned for wood from timber plantations

	Considerations for assessing compatibility with conservation and sustainable use of biodiversity	Indicative alignment with rationale for Indicator B.1
	provisioning services from these ecosystem types is typically incompatible with the sustainable use of biodiversity, although there may be exceptions depending on forestry practices.	
Wild fish and other natural aquatic biomass provisioning	An important distinction for this service is between relatively lower-impact and relatively higher-impact fisheries (or harvesting of other wild aquatic biomass). Lower-impact fisheries are more likely to be compatible with the conservation and sustainable use of biodiversity, while higher-impact fisheries may generate substantial pressures on ecosystems and biodiversity, for example through direct physical impacts on the ecosystem, overexploitation of target stocks or indiscriminate bycatch. In principle, many fisheries can be managed so that target species are harvested at or below sustainable levels (see discussion in Section 7.4 on how unsustainable ecosystem service flows can be flagged in reporting the indicator) and ecosystem impacts are mitigated. An exception is harvesting of threatened fish species, where the conservation status of the species itself is the primary concern, irrespective of harvesting practices. Users of this service may include vulnerable groups such as small-scale and subsistence fishers.	May be well aligned for lower-impact fisheries; typically poorly aligned for higher-impact fisheries.
Wild animals, plants and other biomass provisioning	As for harvesting of fish and other wild aquatic biomass, a key distinction for this service is between harvesting using relatively lower-impact practices and harvesting using relatively higher-impact practices. Lower-impact harvesting is more likely to be compatible with the conservation and sustainable use of biodiversity, while higher-impact harvesting may generate substantial pressures on ecosystems and biodiversity, for example through damage to habitats and overexploitation of target species. In principle, many forms of harvesting of wild plants, animals and other biomass can be managed so that target species are harvested at sustainable levels (see discussion in Section 7.4 on how unsustainable ecosystem service flows can be flagged in reporting the indicator). An exception is harvesting of threatened species, where the conservation status of the species itself is the primary concern, irrespective of the harvesting practices used. Users of this service may include vulnerable groups directly dependent on harvesting resources from the wild for their livelihoods.	May be well aligned for lower-impact harvesting; typically poorly aligned for higher-impact harvesting or harvesting of threatened species.
Water supply	Water supply services reflect the combined ecosystem contributions of water flow regulation, water purification and other ecosystem services to the supply of water of appropriate quality to users for various purposes, including household consumption (SEEA Ecosystem Accounting, Table 6.3). For the purposes of Indicator B.1, the focus	

	Considerations for assessing compatibility with conservation and sustainable use of biodiversity	Indicative alignment with rationale for Indicator B.1
	should preferably be on the regulating services that underpin the quality and timing of water supply for human use.	

6.2 Second stage: Select a set of ecosystem services based on further considerations

Several considerations should be brought to bear in selecting ecosystem services from those prioritised based on their contribution to human wellbeing and compatibility with biodiversity conservation and sustainable use. *Three central considerations* are:

- *National importance and policy relevance:* Depending on the national context, some ecosystem services are likely to be more important than others, for example if a substantial proportion of the population depends on the ecosystem service for their safety or livelihoods or if it has special social or cultural significance.
- *Coverage of all three broad categories of ecosystem services:* This is important for a well-rounded indicator, especially as trends in ecosystem service flows for the different broad categories may move in different directions. There may be trade-offs between different ecosystem services, for example, increases in some provisioning services may be at the expense of some regulating and cultural services.
- *Feasibility of measurement:* Methods and data for quantifying all nationally important ecosystem services, consistent with the characteristics of national ecosystem service datasets described in Section 7.1.1, may not yet be available. Highlighting measurement needs and gaps can help to prioritise and direct data gathering efforts and methodological development for subsequent cycles of national reporting.

Additional aspects that can inform the selection of ecosystem services include the following:

- The ecosystem services selected should preferably *cover all realms* present in the country, including terrestrial, freshwater, marine (if relevant) and transitional realms. This should be treated flexibly, with scope for countries to focus on ecosystem services for those realms that are most widespread. For example, island and archipelagic nations may wish focus strongly on coastal and marine ecosystem services.
- The use of Indicator B.1 as a headline indicator not only for Goal B but also for *Target 11 Restore, Maintain and Enhance Nature's Contributions to People* should be considered. The wording of Target 11 has a strong focus on regulating ecosystem services, including "regulation of air, water, and climate, soil health, pollination and reduction of disease risk, as well as protection from natural hazards and disasters". Including these ecosystem services in Indicator B.1 would enhance its relevance for Target 11.
- Indicator B.1 may also provide relevant information for *Target 9 Manage Wild Species Sustainably to Benefit People*, depending on the ecosystem services included in the indicator in a country. Although Indicator B.1 is not a headline, component or complementary indicator for this target, ecosystem services relating to harvesting of wild species could be relevant for Target 9, and this may be a factor to consider in selecting ecosystem services for inclusion in the indicator at the national level.

6.3 Number of ecosystem services to be included in the indicator

Countries are encouraged to select at least five ecosystem services for inclusion in the indicator, with preferably at least two provisioning services, two regulating services and one cultural service. One of the regulating services should be global climate regulation services (carbon sequestration and storage by ecosystems), in line with the requirement that all countries include this globally important service.

Although five ecosystem services is considered the minimum, the more ecosystem services included the more meaningful and reliable the trends reflected in the indicator will be. As discussed in Step 4 Deriving the indicator (Section 9), the method allows for inclusion of additional ecosystem services over time. This enables *countries to reevaluate the set of ecosystem services selected for Indicator B.1 from time to time, if they wish to.* Additional ecosystem services could be added, for example if new methods and data become available to support their measurement or if they become particularly policy relevant. It is important to take a long-term view of Indicator B.1, with no need to restrict the indicator to ecosystem services that could be measured when it was first compiled.

The two-step aggregation method used to calculate the indicator, explained in Section 9.1, gives equal weight to each of the three broad ecosystem service categories (provisioning, regulating, and cultural) regardless of how many individual services contribute are included in each. Countries should aim for a reasonably balanced number of services across these categories, to avoid a single service in an underrepresented category having disproportionate influence on the overall index. This is particularly relevant when the minimum of at least one cultural service is applied, as a single poorly measured cultural service can introduce substantial noise into the overall indicator.

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7 Step 2. Collecting and organising key datasets

This section gives guidance on national datasets that are required for Indicator B.1, and on global datasets, platforms or tools that can be used as an interim measure in the absence of suitable national datasets. Text from CBD decisions and documents related to the GBF monitoring framework makes it clear that countries should use national data for compiling the indicators, with global datasets used as a back-up option. For Indicator B.1, a country may wish to use national datasets for some ecosystem services selected for inclusion in the indicator and global datasets for others as an interim measure.

This section also discusses the attribution of ecosystem services to ecosystem types and flagging unsustainable ecosystem service flows, both of which are important aspects of the measurement of ecosystem services for Indicator B.1.

7.1 National datasets required for the indicator

National datasets required for Indicator B.1 are:

- Nationally comprehensive datasets on ecosystem service flows for those services selected for the indicator, including supply from all relevant ecosystem types, measured in biophysical terms.
- A national ecosystem map representing the distribution of all ecosystem types present in the country, to which the supply of ecosystem services can be linked. National ecosystem maps are a central requirement for Indicator A.2 and are discussed in greater detail in the Compilation Guidelines for that indicator.

In this section, we outline the key considerations for these datasets. Specifically, we highlight:

- The characteristics and fitness-for-purpose requirements needed to ensure datasets are suitable for Indicator B.1,
- The application of national statistical quality standards and assurance frameworks to maintain consistency, reliability, and comparability,
- The importance of validation through inter-institutional processes that engage relevant experts and other relevant knowledge holders, and foster credibility across sectors.

7.1.1 National datasets on ecosystem service flows

For many countries, developing comprehensive national datasets on ecosystem services is a relatively new process. Although ecosystem services have been measured and assessed in many places around the world over the past two decades and more, this has frequently been at a local or subnational scale or focusing on ecosystem service flows only from specific ecosystem types. Also, not all ecosystem service measurement approaches are consistent with the ecosystem accounting concepts and definitions highlighted in Section 3.

Collecting, consolidating and, if necessary, developing new datasets for Indicator B.1 could thus be a substantial task for many countries and is likely to be achieved gradually, over years. Countries should use the set of ecosystem services they selected for inclusion in the indicator in Step 1 as the initial focus for sourcing and consolidating existing datasets and where necessary developing new

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datasets. Additional ecosystem services that were prioritised for Indicator B.1 (Stage 1) but not selected (Stage 2) are likely to be a useful focus for future consolidation and development of datasets. Over time, a growing set of high-quality national ecosystem services datasets can be become available.

The following characteristics are considered *essential* for national datasets on ecosystem service flows that are fit-for-purpose for use in Indicator B.1:

- The ecosystem service flow should represent the actual supply and use of the ecosystem service (i.e. the match between supply and use), rather than the total potential supply of the ecosystem service or the total demand regardless of whether it is realised, consistent with accounting principles.
- There must be least two time points, and preferably a regular time series that includes at least one year in the period 2011-2020 (the reference period for the GBF monitoring framework) and at least one more recent time point.
- The dataset should be nationally comprehensive, i.e. it should reflect flows of the ecosystem service wherever they occur across the country, from all relevant ecosystem types, not only in certain localities. There may be exceptions to this requirement, especially in large countries, discussed below.

In addition, the following characteristics are *preferable*:

- The supply of each ecosystem service should be attributed to national ecosystem types and/or ecosystem functional groups that supply the service.
- The data should be spatially explicit, i.e. with the ecosystem service supply linked to particular locations.[5]
- Ecosystem services flows should be quantified in biophysical units that are expressed in absolute terms (not, for example, as an index with a value between 0 and 1). Accounting requires measurement of the actual quantity of ecosystem services supplied and used in an accounting period, rather than relative indices that do not represent service flows directly.
- The use of each ecosystem service should be attributed to economic units (key economic sectors, government, households). This is necessary for a complete account, and may provide valuable information from a policy perspective.
- The dataset should have clear institutional ownership, with an intention to update regularly, rather than once-off datasets or research outputs. Annual updates are preferable but may not be practical or essential. Updates at intervals of three to five years can provide an informative basis for tracking change over time while also being realistic in terms of resources required.

Developing ecosystem services datasets typically requires bringing together a combination of ecosystem scientists, environmental economists, statisticians, social scientists, remote-sensing specialists, GIS analysts, hydrologists, Indigenous and local knowledge holders, and sector-specific knowledge holders (for example, related to agriculture, forestry, fisheries, tourism). An

[5] For some ecosystem services, the service may be supplied in one location and used in another. For ecosystem service accounting, where the intention is to link the supply of ecosystem services to particular ecosystem assets and ecosystem types, it is important to map the locations from which the service is supplied. The locations of users may be valuable information from a policy perspective, but it is not needed for compiling the account table or for ecosystem-based disaggregations of the indicator.

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interdisciplinary and collaborative approach is essential, as the full set of necessary expertise is unlikely to exist in-house in national statistical offices.

Depending on the ecosystem service, there are many forms of data from which a national ecosystem service dataset can be developed and a range of possible methods. Data can include national statistics, public surveys, administrative data, population census data, field surveys, hydrological data, earth observation data, data from community-based monitoring and citizen science initiatives, and more, often used in combination to estimate ecosystem service flows. Different methods may be appropriate for measuring the same ecosystem service in different country contexts, depending, for example, on the size of the country and population density.

Quantifying and mapping ecosystem services often involve biophysical modelling. Ecosystem service models could be developed nationally or adapted from globally available models, or globally available models could be applied using national input data. See the *Guidelines on Biophysical Modelling for Ecosystem Accounting* (UN, 2022) for further guidance.

Especially in large countries, nationally comprehensive ecosystem service datasets can be difficult to achieve. In some cases, it may make sense to use partial estimates based on subnational areas or only certain ecosystem types that supply the service, provided they represent the bulk of the ecosystem service flow. For example, a subnational dataset may represent a large majority of the users of the service (e.g. if the country's population is concentrated in parts of the country and sparse in others), or the supply of the ecosystem service may come primarily from certain ecosystem types. If a subnational dataset is used in the indicator, there should be a clear rationale, and limitations should be documented and communicated.

Community-based and Indigenous monitoring systems may provide legitimate and valuable complementary sources of information for ecosystem service measurement, particularly in regions where national monitoring systems remain limited or where ecosystem service dynamics are primarily observed and managed locally. These approaches may improve the accuracy of ecosystem service measurement and mapping and may be particularly relevant for capturing locally grounded and culturally significant ecosystem services as well as relational and other non-material dimensions of ecosystem services that may not be adequately reflected in conventional datasets. Measurement, mapping, interpretation and validation of ecosystem services in Indigenous and traditional territories should involve the participation of Indigenous Peoples and local communities, with their free, prior and informed consent.

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It is *not* expected that all ecosystem service datasets used in the indicator should be formally published in the academic literature. Grey literature and unpublished research can provide valuable sources and may an adequate basis for national ecosystem service datasets, subject to the required characteristics above and national data quality and validation processes discussed below.

Data availability and methods for ecosystem service measurement may improve over time. National ecosystem services datasets should preferably reflect these improvements, which should be back cast across the whole time series for the ecosystem service wherever possible. Where back-casting is not feasible, a break in the time series should be noted. Equally, if a country includes additional ecosystem services in the indicator over time, the time series for the ecosystem services that are added should preferably be back cast to the start date of the time series for the ecosystem services already included. Also see Section 8.3 on consistency across accounting periods.

As noted in the introduction, guidance on data requirements and methods for developing datasets for specific ecosystem services is beyond the scope of these guidelines. See Section 11 for descriptions of complementary resources available to countries.

7.1.2 National ecosystem maps

In addition to national datasets on ecosystem services, national ecosystem maps are preferably required for ecosystem services accounts. A national ecosystem map provides information about which ecosystem types exist in a country and their spatial distribution, linked to a national ecosystem classification (see Section 4.2). It can greatly facilitate development of nationally comprehensive ecosystem service datasets, as characteristics of different ecosystem types can often be linked to ecosystem service supply. Even if a national ecosystem map is not used directly in developing ecosystem service datasets, it can support attribution of ecosystem service flows to ecosystem types. *Indicator B.1 should use the same national ecosystem map and classification as used for Indicator A.2*, for coherence between the two indicators. The Compilation Guidelines for Indicator A.2 provide more detail on national ecosystem maps.

7.1.3 Data quality and validation of national datasets

National datasets used for Indicator B.1 should be of suitable quality, both in terms of fitness for purpose and technical quality. Specific technical and statistical data quality standards should be determined by countries in their national context. National statistical offices are likely to have established data quality assessment frameworks (DQAF) that would apply, building on the Fundamental Principles of Official Statistics and the UN National Quality Assurance Frameworks Manual for Official Statistics (see Box 1). Chapter 7 of the *Guidelines on Biophysical Modelling for Ecosystem Accounting* (UN, 2022) provides more detail on each of the dimensions listed in Box 1.

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Box 1. Data quality dimensions

The UN National Quality Assurance Framework for Official Statistics (UN, 2019) distinguishes the following quality dimensions that can be used to characterise the quality of a statistical product, as specified in Principles 14-18:

• *Relevance*: the extent to which the statistics satisfy the needs of the users.
• *Accuracy*: the closeness of estimates to the exact or true values that the statistics were intended to measure.
• *Reliability*: the closeness of the initially estimated value(s) to the subsequent estimated value(s) if preliminary figures are disseminated.
• *Timeliness*: the length of time between the end of a reference period (or date) and the dissemination of the statistics.
• *Punctuality*: the time lag between the release date and the target date by which the data or statistics should have been delivered.
• *Accessibility*: the ease and conditions with which statistical information can be obtained.
• *Clarity*: the availability of appropriate documentation relating to the statistics and additional assistance that producers make available to users.
• *Coherence*: the ability to reliably combine statistics and data sets in different ways and for various uses. Consistency is often used as a synonym for coherence.
• *Comparability*: the extent to which differences in statistics from different geographical areas, non-geographical domains, or over time, can be attributed to differences between the true values of the statistics.

In addition to meeting statistical and technical data standards, national datasets on ecosystem services should be validated through appropriate institutional processes within the country to ensure they are seen to provide a credible representation of actual ecosystem service flows.

This should include an assessment of the suitability of ecosystem service data for ecosystem services accounting. In particular, it should address:

- Are the ecosystem services meaningfully defined from both an ecological and socio-economic perspective?
- Do the ecosystem service flows represent the match between supply and use?
- If the dataset is spatially explicit, is the geographic distribution of the ecosystem service flows plausible/credible?

Such a validation process requires involvement of relevant in-country knowledge holders for each ecosystem service. The objective is to ensure that datasets provide a credible representation of the country's ecosystem services, not that they are perfectly accurate. Uncertainty or confidence levels should preferably be documented as part of the validation process. It is also useful for the process to identify and document key knowledge gaps and research or other further work needed to fill them.

The same approach to validation applies to national ecosystem maps, as discussed in the Compilation Guidelines for Indicator A.2.

7.2 Global datasets and models as an interim option

In the context of ecosystem accounting, *global datasets* are typically spatial datasets covering the whole planet, providing standardised information across countries. "Global data" can encompass

raw earth observation data, derived data products, and global statistics. Many global datasets are produced from remote sensing, in some cases combined with ground observations and statistical data. Global datasets are typically developed top-down, but in some cases are developed bottom-up, for example by compiling national datasets contributed by countries (the World Database on Protected and Conserved Areas is an example of this approach). Not all global datasets are spatially detailed; for example, global tourism statistics are often disaggregated only to country level.

Global models use environmental inputs (e.g. climate, land cover, soil data) to estimate ecosystem characteristics or services. For example, models may estimate carbon storage, water regulation, or soil erosion across the globe. These models can be used to produce global datasets as outputs, typically drawing on global input data. It may be possible to populate a global model with national datasets, provided the national data can be harmonised to the model's required variables, spatial resolution and methodological definitions.

Global products (datasets or models) can provide complete spatial coverage of the globe and methodological consistency, but may be less accurate or meaningful at national or local scales for a range of reasons. For example, they may be developed using coarse spatial resolution, based on generalised assumptions that may not apply everywhere in the world, and/or developed and trained using data from very different parts of the world. This means that global datasets and models should be used with caution for national or local applications. Best practice in ecosystem accounting is usually to validate and, in some cases, to populate a global model with national datasets and coefficients. In cases where regional or continental datasets or models are available, the assumptions embedded in them may be less generalised than for global ones but the same cautions and need for validation apply.

Global datasets and the outputs of global models may not be "ecosystem account-ready" for various reasons, including using classifications that do not align with ecosystem accounting classifications, methodological inconsistencies with accounting requirements (such as definitions, measurement concepts), and spatial inconsistencies or overlaps. These issues often mean that global datasets need processing and harmonisation before they can be used in ecosystem accounts.

A number of freely available ecosystem service modelling platforms exist – see Box 2 for some examples. Chapter 6 of the *Guidelines on Biophysical Modelling for Ecosystem Accounting* (UN, 2022) provides more detail on these and other platforms, including which ones provide estimates for which ecosystem services. Data products and models related to ecosystem services are continually being developed in response to user needs, so it is difficult for any review to be completely comprehensive and up to date.

If a country does not have adequate or suitable national datasets for a sufficient number of ecosystem services for Indicator B.1, the following is recommended:

- The process of developing national datasets for the set of ecosystem services identified for inclusion in the indicator in Step 1 should be initiated, ideally to be ready for the next cycle of national reporting to the CBD.
- Use of global datasets or models should be considered as an interim alternative, subject to assessment of their quality (based on the same quality assurance principles used for national

datasets) as well as validation processes to assess their suitability for use in the national context (as discussed below).

- Hybrid options should be considered. For example, it may be possible for a country to use global models populated with national datasets, or to develop their own national models that can be populated with available global datasets.
- As noted, a country may choose to use national datasets for some ecosystem services and global datasets others.

Box 2. Examples of freely available global platforms that may provide useful models and/or datasets on ecosystem services for use at the national level

- ARIES for SEEA platform. Global datasets for four ecosystem services (grazed biomass provisioning, global climate regulation services, coastal protection services and nature-based tourism) that are currently being developed as a backstop to support countries reporting on indicator B.1. Datasets for crop provisioning and soil erosion control are also available via the ARIES for SEEA Platform.
- InVEST models and tools,
- Co$ting Nature, which focuses on 18 ecosystem services from natural environments,
- Models and tools that have been developed for Europe as part of the INCA Platform. This platform is freely available to countries outside Europe, but for countries outside Europe additional work would be required to prepare data to fit the format required by INCA.

Global datasets and model outputs should be assessed for their suitability for use in the national context before they are used to compile the indicator, through appropriate institutional processes involving relevant in-country knowledge holders. The purpose of validation is to ensure that the global dataset or model output gives a sufficiently credible representation of ecosystem services within the country, not that it is perfect. The need for national validation of global datasets is emphasised in the CBD Decisions related to the monitoring framework.

In assessing the suitability of a global dataset or model output, particular attention should be paid to its spatial and thematic integrity and accuracy in the national context. In other words, does it provide a good enough representation of the reality in the country? By definition, if a country does not have a suitable national dataset, it will be difficult to undertake a quantitative validation process, so expert judgement is likely to play a key role. Convening the right experts and other relevant knowledge holders is important, and the process could involve interagency review. Cross-comparison with in-country case studies, other countries' assessments and/or other ecosystem service proxies may be useful exercises. Documenting this process, including technical, social and institutional aspects, is encouraged.

Considerations for an expert-based review process include:

- An initial sense-check, answering questions such as: If we zoom in to specific parts of the country that we know firsthand, does this dataset provide sensible information, or is it substantially different from what we know to be the reality? If we look at the overall national picture provided by this dataset, is it plausible? This kind of sense-check is the minimum required for an expert-based validation process, and can often provide valuable insights.
- What input data were used to produce the global dataset or model outputs? Were the input data a suitable representation of the national reality?

- Was the global dataset or model ground-truthed in its development? If so, did the ground-truthing take place in locations with similar characteristics with respect to ecosystem services supply and use to your country (e.g., environmental, ecological, socio-demographic and economic characteristics)?
- Is the dataset supported with sufficient methodological documentation, including limitations and accuracy assessment?
- Are editions of the dataset consistent with each other in terms of methods and measurement?
- Does the dataset come from a trusted data provider with long-term, regular production assured (i.e., an institution with a mandate to develop this dataset)?

If sufficient resources are available, assessment of the suitability of global datasets for national use could go beyond expert-based approaches to include:

- Semi-quantitative assessment (e.g., comparing marginal values for biomass yield per hectare)
- Quantitative validation comparing global model outputs with partial or proxy national data on absolute values and trends. If data exists for one or more subnational or local areas within a country, these data could be used to validate a global dataset or model output in those areas, and results may be able to be extrapolated to other parts of the country with similar characteristics.

If the global dataset or model output does not pass either an expert-based review or more quantitative validation, it should not be used for reporting on the indicator, at the risk of providing information that could be substantially inaccurate and even misleading.

7.3 Attributing ecosystem service flows to ecosystem types

In ecosystem services accounting, flows of ecosystem services should be attributed to ecosystem types, with the ecosystem service supply table (shown in Table 5 in Section 8.2) recording the quantity of each ecosystem service supplied by specific ecosystem types. This enables links to be made between ecosystem extent, condition and services accounts. It also enables ecosystem-based disaggregations of Indicator B.1 (by realm, biome and ecosystem functional group), as well as links with other headline indicators dealing with ecosystems, as discussed in Section 4.3. However, attribution or linking of ecosystem services flows to ecosystem types can be complex in practice.

In some cases, national ecosystem maps serve as inputs to ecosystem service models, enabling direct attribution of services to ecosystem types. Where this is not possible, services may still be linked to ecosystem types through:

- *Conceptual association based on ecological characteristics*, i.e. identifying which ecosystem types can plausibly provide a given service. For example, wood provisioning is typically supplied by forest ecosystem types, other woody ecosystem types, and timber plantations. This approach can be applied even when service flow datasets are not spatially explicit (e.g. administrative data without georeferencing).
- *Spatial overlay of ecosystem service datasets with a national ecosystem map,* provided both are spatially explicit at comparable scales. This can be combined with conceptual associations to exclude implausible combinations of ecosystem services and ecosystem types, reducing mapping

errors. For example, a country may use geotagged social media photographs and visitor statistics to map nature-based tourism activity, resulting in a spatial dataset that identifies locations where recreation services are being used. Overlaying the dataset with the national ecosystem map may associate tourism activity with savannas, lakes, beaches, urban settlements and industrial areas. Conceptual assessment can then be used to identify the ecosystem types plausibly supplying the nature-based tourism opportunities, while excluding associations that are likely to reflect nearby accommodation, transport hubs or other infrastructure rather than the ecosystems generating the service.

For global reporting of Indicator B.1, ecosystem services should preferably be attributed to specific ecosystem functional groups of the Global Ecosystem Typology. If this is not possible, attribution to biomes is a second-best option, with realms as a third-best option. If an ecosystem service cannot be attributed to specific ecosystem functional groups or biomes or realms, it may nevertheless be possible to attribute it either to natural ecosystems or to anthropogenic ecosystems (as broad categories), which would be helpful for alignment with Indicator A.2.

If resources for investing in ecosystem services accounting to contribute to Indicator B.1 are constrained, countries are encouraged to focus on developing datasets and accounts for additional ecosystem services rather than investing in analyses to attribute ecosystem service flows to ecosystem types in accounts (formal or preliminary) that already exist.

7.4 Flagging unsustainable ecosystem service flows

The metadata for Indicator B.1 notes that: “Goal B emphasises that ecosystem services should support sustainable development for the benefit of current and future generations. Some (not all) ecosystem services can be used above their regeneration or absorption rate, with a negative impact on the capacity of the ecosystem to generate such services in the future. In such cases, the current use of the ecosystem service is not sustainable and does not support sustainable development. Ideally the indicator would distinguish between sustainable and unsustainable current use of ecosystem services. In practice it is often difficult to identify when the current use of an ecosystem service has crossed a sustainability threshold, but where possible Parties will be encouraged to flag ecosystem services where sustainability thresholds may have been crossed. Nevertheless, it is likely to be challenging to address this aspect fully in the indicator.”

To address this issue, countries are encouraged to identify those ecosystem services included in the indicator that may be overused, and, if possible, to assess whether flows of those ecosystem services were sustainable or not in each accounting period. Following La Notte et al (2021), overuse is part of the complementary information that can reported together with the ecosystem services accounts, as described below.

In the context of ecosystem services, overuse relates to scenarios in which the use of a service in an accounting period (for example, a year) goes beyond its sustainability threshold (La Notte et al., 2021). Three types of sustainability thresholds can be identified:

- *Regeneration rates* – these apply especially to provisioning services that rely on harvesting of wild resources. Examples include mean annual increment (MAI) for wood provisioning and maximum sustainable yield (MSY) for wild caught fish.
- *Absorption rates* – these apply especially to regulating services that involve absorption of pollutants or excess nutrients. Examples include thresholds related to absorption of air or water pollutants.
- *Carrying capacity limits* – these apply to provisioning services where biomass is grazed in natural ecosystems (including modified natural and semi-natural ecosystems), and to cultural services where large numbers of users may impact negatively on the ecosystem's continued ability to supply the service. Examples include sustainable stocking rates for grazing (e.g. number of large livestock stock units or small livestock units per hectare of land), and maximum visitor numbers for protected areas.

Table 4 provides a high-level assessment of which ecosystem services in the SEEA Ecosystem Accounting reference list are subject to sustainability thresholds, together with illustrative examples of such thresholds.

Table 4. Ecosystem services in the SEEA reference list for which sustainability thresholds are relevant, with illustrative examples of thresholds

Ecosystem service	**Type of sustainability threshold**	**Illustrative examples of sustainability thresholds**
Grazed biomass provisioning services	Carrying capacity	Sustainable stocking rate (e.g. livestock units per hectare); Maximum grazing pressure compatible with acceptable ecosystem condition**
Wood biomass provisioning services	Regeneration rate	Mean annual increment (MAI); Annual harvest not exceeding net growth
Wild fish and other natural aquatic biomass provisioning services	Regeneration rate	Maximum Sustainable Yield (MSY); Fishing mortality below target reference points
Wild animals, plants and other biomass provisioning services	Regeneration rate	Sustainable harvest quota; annual harvest not exceeding population or biomass regeneration
Genetic material services	Regeneration rate	Sustainable collection limits; Minimum viable population thresholds for source populations
Air filtration services	Absorption rate	Pollutant loads within ecosystem assimilation capacity; Critical loads for atmospheric pollutants
Solid waste remediation services	Absorption rate	Waste inputs not exceeding decomposition or assimilation capacity of the ecosystem
Water purification services (retention and breakdown of nutrients and/or other pollutants)	Absorption rate	Nutrient or pollutant loads not exceeding ecosystem retention or processing capacity; Water quality thresholds
Recreation-related services – nature-based tourism*	Carrying capacity	Maximum visitor numbers; Level of visitor pressure compatible with acceptable ecosystem condition**
Recreation-related services – day-to-day nature-based recreation*	Carrying capacity	Visitor density thresholds; Maximum use levels compatible with user experience and acceptable ecosystem condition**

*For recreation-related services it is in principle appropriate to consider sustainability thresholds; in practice methodologies may not be currently available.

** Acceptable ecosystem condition would in these cases need to be determined. It need not imply good ecosystem condition and may reflect societally agreed trade-offs between ecosystem condition and the flow of ecosystem services.

Sustainability thresholds should, wherever possible, be grounded in ecosystem science, while recognising that other factors may also shape their determination. For example, agricultural science can inform carrying capacity limits for livestock grazing in rangelands, while policy frameworks may prescribe thresholds in certain cases. Thresholds may be derived from empirical data or estimated by relevant experts and knowledge holders, and in practice they are often influenced by social considerations within the national context. Even when scientifically based, thresholds can reflect societal judgments—for instance, acceptable levels of ecosystem impact from nature-based tourism. It is therefore important to situate sustainability thresholds within national circumstances, acknowledging that thresholds may differ across countries for the same ecosystem service.

For each ecosystem service for which there are limits to sustainable flows based on such thresholds, a *sustainability ratio* should be estimated based on *the proportion of the actual flow in a particular accounting period that is estimated to be sustainable.* The sustainability ratio is calculated as the estimated sustainable flow divided by the actual flow. A sustainability ratio of 1 means that the actual flow of the ecosystem service is considered sustainable, while a sustainability ratio of less than 1 means that the actual flow is considered unsustainable (i.e., it exceeds the sustainable flow). For example, if the maximum sustainable yield of wild harvested fish is estimated to be 100 tons per year, and the actual catch is 100 tons in a particular year, the sustainability ratio for that accounting period would be 1 (100/100 = 1). If the actual catch was 200 tons, the sustainability ratio would be 0.5 (100/200 = 0.5).

If the sustainability ratio for an ecosystem service is less than 1, that ecosystem service should get an *unsustainable use flag*, as illustrated in Figure 10. The flag provides a cautionary note for interpreting the indicator, suggesting that an increase in the flow of this service may indicate increased pressure on biodiversity, while a decline may indicate reduced pressure on biodiversity (while noting that the ecosystem service flow may remain unsustainable even if it declines).

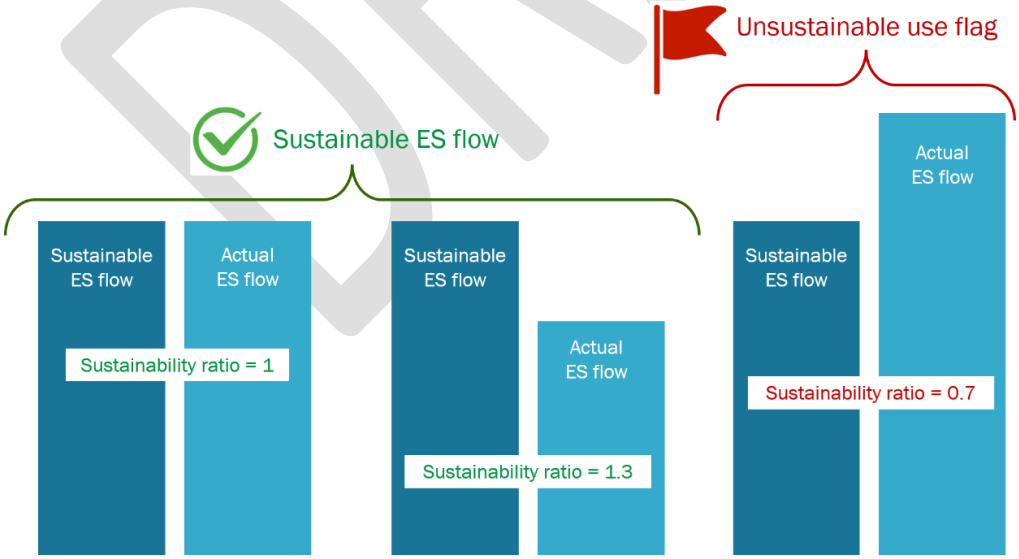

Figure 10. Illustration of the sustainability ratio for ecosystem services that are subject to a sustainability threshold, with a sustainability ratio of less than 1 resulting in an unsustainable use flag

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Sustainability assessments for ecosystem services could be data driven or could be based on expert judgement and/or Indigenous or local knowledge if thresholds have not been established and quantitative assessments are not available, preferably using a structured elicitation process that is clearly documented. It may be possible to undertake data-driven sustainability assessments for some ecosystem services included in the indicator while relying primarily on expert judgement for others. Sustainability of flows of some ecosystem services may not be uniform across the country. In such cases, an average sustainability ratio should be estimated, using quantitative data or expert judgement or a combination.

Alongside the indicator itself, as complementary information, countries could report which ecosystem services included in the indicator have an unsustainable use flag, how it was assessed (e.g. quantitative or expert-based), and the number of unsustainable use flags relative to the total number of ecosystem services included. Because the number of ecosystem services included in the indicator may be small, it is suggested that the unsustainable use flags be reflected as an absolute number (for example, two out of six ecosystem services) rather than a percentage (for example, 33.3% of ecosystem services). Countries may also wish to report the mean value of the sustainability ratios (for example, if ratios are 0.5 and 0.9, the mean value would be 0.7).

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8 Step 3. Compiling the accounts

This section discusses different scenarios that a country may face regarding the existence of ecosystem services accounts, and gives guidance on preliminary options for compiling the indicator in the absence of formal ecosystem services accounts. It explains the method for deriving the indicator from the accounts in more detail than in the metadata. Lastly it provides guidance on the optional disaggregations for Indicator B.1.

8.1 Possible scenarios regarding ecosystem services accounts in a country

There are two main scenarios a country may face regarding ecosystem services accounts, with different implications for Indicator B.1, shown in Figure 11. It is important that *a country can compile and report on Indicator B.1 from the starting point of either scenario, i.e. even if it does not yet have formally published national ecosystem services accounts*. In many countries, substantial research has been undertaken on ecosystem services that could be drawn on, and accounts may have been compiled in a research or experimental context. Nevertheless, countries that do not yet have formal ecosystem services accounts are encouraged to embark on the process of developing them, especially bearing in mind the range of applications of these accounts over and above compiling and reporting on Indicator B.1.

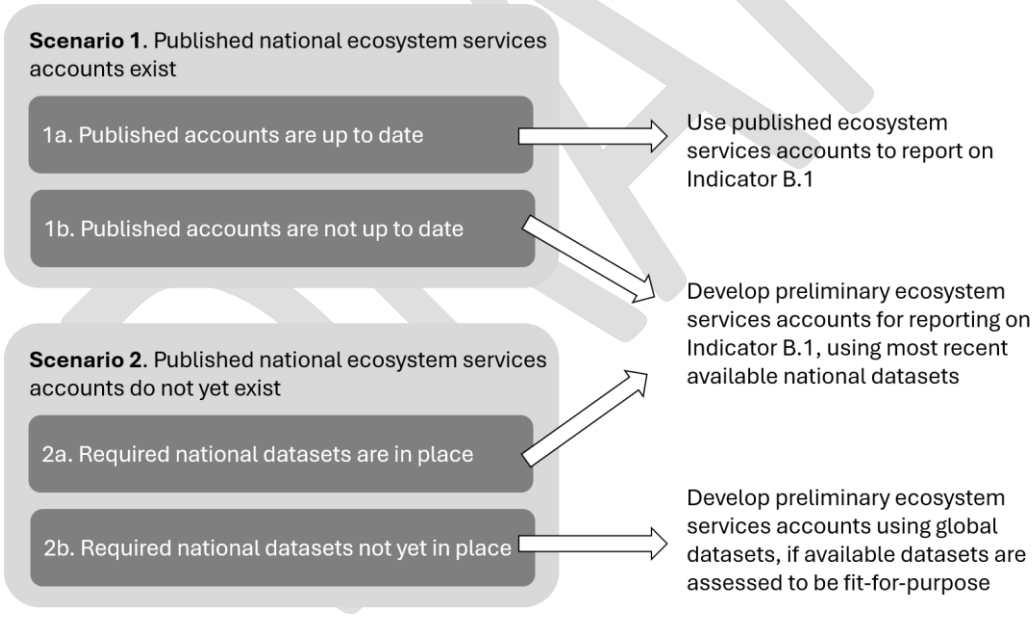

Figure 11. Possible scenarios regarding ecosystem extent accounts in a country, with implications for Indicator B.1.

A country may face different scenarios for different ecosystem services that have been selected for inclusion in the indicator, and could use a combination of ecosystem service accounts from Scenarios 1a, 1b, 2a and 2b in the indicator, aiming to move them all to Scenario 1a over time.

If published ecosystem services accounts exist, compilers of Indicator B.1 should assess whether the accounting periods align with the reporting requirements for the indicator (See Step 5 Reporting on the indicator). These include values for at least one year in the period 2011-2020 and at least one

more recent time point, but the more time points for which accounts are available the better, including before 2011 and after 2020. It may be that existing ecosystem services accounts were produced some time ago, in which case preliminary accounts for a more recent accounting period should be developed.

Ecosystem accounts published by a national statistical office (or perhaps another government agency or ministry in some cases) would typically be subject to established national institutional processes to ensure their quality and credibility. However, further institutional processes may be required to confirm the information to be reported for the indicator. This should include national technical entities with mandates relevant to the indicator, especially if they were not directly involved in developing or validating the accounts.

In the absence of formally published ecosystem services accounts, or if existing accounts are not up to date, preliminary accounts can be developed to provide the information needed for Indicator B.1. The accounts could be preliminary in two senses:

- Not yet formally approved and published by the national statistical office,
- Not including all elements required for ecosystem services account tables.

If the required national datasets are available, they should be used to develop the preliminary accounts. If national datasets are not available but suitable global datasets are available (as assessed in Step 2), they can be used instead. As noted, a country may choose to use national datasets for some ecosystem services and global datasets for others. As part of compiling the preliminary accounts, further work required to develop a formalised ecosystem services account could be assessed and documented.

As noted earlier, the development of Indicator B.1 should be approached as a collaborative cross-ministerial and multi-agency process, involving technical entities with relevant competencies and mandates. In all ecosystem accounting, knowledge and judgement across a range of disciplines is needed to ensure that source datasets are meaningfully interpreted and the resulting accounts are credible. Relevant experts and other knowledge holders should be involved throughout the process, even for a preliminary account, and “preliminary” should not imply poor quality. In particular, it is essential that knowledge holders who understand the country’s ecosystem services from ecological and socio-economic perspectives are involved. This could be done through structured expert elicitation, documented to ensure repeatability and transparency. Quantitative or qualitative uncertainty levels (for example confidence intervals or expert-judgement scores) should preferably be recorded.

Preliminary accounts should be validated through appropriate national processes, depending on national institutional arrangements and context. This could include steps such as: (1) internal expert review across agencies involved in developing the account, (2) spatial accuracy checks (ideally quantitative but at least an expert-based qualitative assessment), and (3) public consultation or peer review. This would strengthen credibility even before formal publication by the national statistical office.

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8.2 Basic and interim options for preliminary accounts

An ecosystem services account in biophysical terms records the quantity of an ecosystem service that is supplied by ecosystem assets and used by economic units over the course of an accounting period, ideally for several ecosystem services. The measurement units are physical units, such as cubic meters, tonnes or numbers of people, depending on the ecosystem service. An ecosystem service account table is known as a supply and use table and follows a standard structure, with a supply component and a use component, shown in Table 7.1 of SEEA Ecosystem Accounting. Indicators that can be derived from the account tables include percentage change in ecosystem service flows over an accounting period or with respect to a baseline period.

A separate account table is prepared for each accounting period. The accounting period is typically a year, but could be longer or shorter. An account could be compiled for some years and not others (e.g. an account could be compiled for 2015, 2020 and 2025, but not for the intervening years).

The quantity of each service that is supplied must equal the quantity that is used, consistent with the accounting requirement that supply matches use. Supply should be disaggregated by ecosystem type, and use should be disaggregated by categories of users, such as businesses, government and households. This makes it possible to link the flow of an ecosystem service directly to certain ecosystem types, and to identify who benefits from the ecosystem service.

In practice, just the supply component of the supply and use table can be compiled if a breakdown of users of the ecosystem service is not available – this is a common scenario. See Table 5 for an example. Because Indicator B.1 does not require disaggregation by users of the ecosystem service, this can be a useful option for countries that are new to ecosystem services accounting.

Table 5. Basic ecosystem services account table for one accounting period (supply table only)

	National ecosystem types (ETs) (or a global proxy, preferably EFGs)							**Total supply in year X**
	ET1	ET2	ET3	ET4	ET5	ET6	…	
Ecosystem service 1								
Ecosystem service 2								
Ecosystem service 3								
Ecosystem service 4								
Ecosystem service 5								
…								
…								

In practice, it can be challenging to attribute the provision of an ecosystem service to particular ecosystem types, as discussed in section 7.3. In cases where it is possible to do this for some ecosystem services but not others, the supply table could provide the breakdown by ecosystem type for some ecosystem services and for others just give the total in the final column.

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As an interim option, the table could show just the total quantity of each ecosystem service supplied, i.e. with no information about ecosystem types or users. At least two time points would be needed to calculate the indicator. See Table 6 for an example.

Table 6. Interim option for an ecosystem services supply table, if attribution of ecosystem services to ecosystem types is not possible

	Total ecosystem service flow in year X	**Total ecosystem service flow in year Y**
Ecosystem service 1		
Ecosystem service 2		
Ecosystem service 3		
Ecosystem service 4		
Ecosystem service 5		
…		
…		

8.3 Consistency across accounting periods

Ecosystem services accounts should preferably be compiled over multiple accounting periods, during which data sources, methods and classifications may evolve. As discussed in Section 2.4, one of the strengths of an accounting approach is that it is built on stable concepts and classifications, allowing data and methods to improve over time while maintaining a consistent basis for measurement. Nevertheless, apparent changes in ecosystem services between accounting periods may sometimes reflect improvements in data, methodological differences or changes in the definition of an ecosystem service rather than genuine changes in ecosystem service flows.

This consideration is particularly important for Indicator B.1. In many countries, compilation may begin using global datasets as an interim solution and progressively transition towards national datasets of increasing quality, resolution and completeness as new information becomes available. The number of ecosystem services for which national datasets exist is also likely to increase over time. While these developments improve the quality and relevance of the indicator, they can also introduce discontinuities in the time series if not managed carefully.

In cases where data sources or methods change, standard statistical practice provides two main approaches. The preferred approach is to recalculate, or back-cast, the time series using the updated data source or method so that estimates remain comparable across accounting periods. Where this is not feasible, the resulting break in the time series should be clearly documented and communicated. Any methodological changes between reporting cycles for the indicator should therefore be fully recorded in technical documentation and, where possible, corrected through recalculation of earlier estimates or otherwise explicitly flagged as a break in series.

Particular attention should be given to changes in the selection of ecosystem services included in the indicator, including increases in the number of ecosystem services, which need to be clearly communicated. Implications for how the indicator is calculated are discussed in Step 4 Deriving the indicator from the accounts (Section 9).

9 Step 4. Deriving the indicator from the accounts

9.1 Aggregating ES flows to derive the indicator

Deriving Indicator B.1 involves aggregating data drawn from the ecosystem service account tables to provide an overall picture of trends in ecosystem service flows over time. This creates the challenge of combining trends in services measured in different and incommensurable units (such as cubic meters, tonnes, numbers of people). To overcome this, Indicator B.1 takes the form of an aggregate ecosystem services index based on trends in ecosystem service flows, similar to other biodiversity indicators (such as the Living Planet Index, Collen et al., 2009). This means that the biophysical units for each ecosystem service are converted to a proportional change in the flow of that service relative to a base year (t_0), and the average proportional change across ecosystem services is reported.

These relative ecosystem service flow values are multiplicative measures. If the flow of a service increases from 100 physical units at t_0 to 200 units in some latter year (t_1), the relative flow will be 1 in t_0 and 2 in t_1 (it doubles). If the flow of another service decreases from 100 physical units in year t_0 to 50 in t_1, the relative flow will be 1 in t_0 and 0.5 in t_1 (it halves). In additive terms, the change in the provision of the first ecosystem service is greater than the change in the second. However, regarded as a multiplicative measure, one rate of change is the inverse of the other (i.e., ½ = 0.5), giving self-consistency with respect to proportionate changes in ecosystem service provision over time. Due to this multiplicative nature of these relative measures, they are best characterised as geometric trends, not arithmetic (Buckland et al., 2011).

Following Buckland et al. (2011), when averaging a multiplicative measure (i.e., the average Geometric Mean Annual Change of different ecosystem services provided), it is natural to use the geometric mean. Using the geometric mean is desirable for indicator B.1 because the doubling of one service offsets a halving of another (e.g., GeoMean (0.5, 0.5,2,2) = 1).

There are other desirable mathematical properties of using the geometric mean to average relative flows of ecosystem services. The geometric mean is less sensitive to a big change in the relative flow of one service out of the set of selected ecosystem services, compared to the arithmetic mean. This makes the geometric mean a more desirable approach when tracking average trends across the collective set of ecosystem services.

Furthermore, the geometric mean is not sensitive to the base year chosen for the indicator. This means that for comparison between countries and regions, whilst the same base year must be used, resetting the base year of the geometric mean does not require access to the underlying data in absolute terms (based on Van Strien et al., 2012). Thus, cross-country comparability and global aggregation of Indicator B.1 will be relatively straightforward.

It is recommended that the average change in the provision of the selected set of ecosystem services should be calculated using a geometric mean via the ‘chain method’ (used in the Living Planet Index, see Collen et al., 2008):

$$I_{t=}I_{t-1} * \left(\prod_{i=1}^{n} \frac{S_{i,t}}{S_{i,t-1}}\right)^{\frac{1}{n}} \quad \text{equation 1}$$

Where $S_{i,t}$ represents the quantity of the *i*th ecosystem service in year *t*, $S_{i,t-1}$ is the amount of the service in the previous year, and *n* is the number of ecosystems or ecosystem services within that category. In equation $\left(\prod_{i=1}^{n} \frac{S_{i,t}}{S_{i,t-1}}\right)$ is equivalent to the geometric mean of the interannual variation of the relative flow of each ecosystem service in a category between year t-1 and t.

To calculate Indicator B.1, a two-step aggregation (or geometric mean averaging) process is recommended using the chain method, as per the outcome of the testing of Indicator B.1 undertaken in 2024 (Nicholson & Traurig, 2024). The two-step approach first calculated the geometric mean of the proportionate changes in the provision of all selected ecosystem services within each of the broad categories of ecosystem services (i.e., provisioning, regulating and cultural indices, using geometric mean of time-series within the group). Calculating the three sub-indices enables trade-offs between the flows of ecosystem services across these broad categories to be revealed (e.g. increases in provisioning services could be at the expense of regulating and cultural services).

The overall aggregate index for all ecosystem services (i.e., Indicator B.1) is then calculated by taking the geometric mean of the three sub-indices to calculate the overall index. This gives equal weight to each broad ecosystem service category, regardless of how many individual ecosystem services contribute to each sub-index. The Living Planet Index does a version of this across taxonomic groups, so that the influence of declines in amphibians (relatively fewer data) is not hidden by declines in birds (which are data-rich).

Missing data for calculating the indicator is likely to be a common problem faced when using data from ecosystem services accounts. Ideally the accounts would be populated with annual estimates on the flows of all ecosystem services selected for the indicator. However, realistically, particularly with historical data, this is unlikely to be the case. The simplest approach to address this is to apply a log-linear interpolation for imputing missing values. This can be done using the chain method described in the following formula (see Collen et al, 2008):

$$N_t = N_P \left(\frac{N_S}{N_P}\right)^{\frac{i-P}{S-P}} \quad \text{equation 5}$$

where N_t is the interpolated value for missing year t, N_P is the value in a preceding year p with a measured value, N_S is the value in a subsequent year with a measured value. If there is data from only a few, non-consecutive years, this approach can be used to interpolate missing years based on assuming a constant annual rate of change in the flows of ecosystem services between the years for which data is available. This is unlikely in reality but it does allow for a consistent time series of aggregate trends to be determined. Interpolation of missing data would need to be conducted at the lowest levels that it is received (i.e. ecosystem service or ecosystem subgroups were available).

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Table 4 provides an example of based on the physical ecosystem services accounts developed by Statistics Netherlands. This will provide the common starting point for calculating the aggregate ecosystem services index for Indicator B.1.

To calculate the indicator using the chain method, the interannual change in the flow of each ecosystem service needs to be calculated. In Table 8 this is calculated simply as the flow in year t / flow in year t-1 from the biophysical measures presented in Table 7. Where there are missing values in Table 5, these can be estimated using the equation 5 and the approach described above.

In the first step of the aggregation process, the indicator should be calculated for each broad category of ecosystem services (provisioning, regulating and cultural) using the chain method. For example, in Table 8, this is first calculated for 2014 as the value of the index in the base year 2013 (1) * GeoMean of the interannual change of all services between 2013 and 2014 in each broad category that are presented in Table 7. Once the value for 2014 is determined, the value for 2015 is calculated in the same way (hence the 'chain' method).

As shown in Table 9, the chain method should then be used to aggregate the three sub-indices to an overall index that is Indicator B.1. This ensures that each broad category of ecosystem services influences the indicator equally, even if the number of ecosystem services included in the indicator is uneven across these broad categories.

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Table 7: Ecosystem services account for period 2013 to 2021 (in biophysical terms, supply table only)

Ecosystem service	ES category	2013	2014	2015	2016	2017	2018	2019	2020	2021
Crop production (kton)	Provisioning	17 922	19 899	17 245	17 567	20907	17 322	19 109	19 084	18 868
Fodder/grass production (kton)	Provisioning	18 715	20 348	16 966	17 727	19467	15 613	16 294	16 767	17 359
Timber production (1000m3)	Provisioning	2 445	2 405	2 359	2 318	2285	2 251	2 218	2185	2149
fish (ton)	Provisioning	141 703	129 676	158 717	123 795	154 339	131 598	100 940	90 744	91 264
Water purification (million m3)	Regulating	425	416	421	426	429	451	441	458	441
Air filtration (na)	Regulating	3 262	3 166	2 572	2 499	2460	2 659	2 368	1 965	2038
Carbon sequestration in biomass and soil (kton soil)	Regulating	601	601	606	607	606	604	603	602	603
Rainwater regulation (mln ltr in 1 hr)	Regulating	1 132 649	1 131 736	1 130 890	1 130 446	1 130249	1 129946	1 129745	1 129521	1 129 394
Pollination (kton)	Regulating	334	350	366	361	306	355	347	334	322
Nature recreation (million activities)	Cultural	1 011	1 004	989	978	1020	1 063	1 098	1 316	1 649
Nature tourism (1000 overnight stays)	Cultural	53 127	53 337	53 459	56 341	66087	69 256	62 281	52 928	67 269

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Table 8: Proportionate interannual change in ecosystem service flows (flow in year t / flow in year t-1 from the biophysical measures presented in Table 4)

Ecosystem service	ES category	2013	2014	2015	2016	2017	2018	2019	2020	2021
Crop production (t/t-1)	Provisioning	1.00	1.11	0.87	1.02	1.19	0.83	1.10	1.00	0.99
Fodder/grass production (t/t-1)	Provisioning	1.00	1.09	0.83	1.04	1.10	0.80	1.04	1.03	1.04
Timber production (t/t-1)	Provisioning	1.00	0.98	0.98	0.98	0.99	0.99	0.99	0.99	0.98
fish (t/t-1)	Provisioning	1.00	0.92	1.22	0.78	1.25	0.85	0.77	0.90	1.01
Water purification (t/t-1)	Regulating	1.00	0.98	1.01	1.01	1.01	1.05	0.98	1.04	0.96
Air filtration (t/t-1)	Regulating	1.00	0.97	0.81	0.97	0.98	1.08	0.89	0.83	1.04
Carbon sequestration in biomass and soil (t/t-1)	Regulating	1.00	1.00	1.01	1.00	1.00	1.00	1.00	1.00	1.00
Rainwater regulation (t/t-1)	Regulating	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Pollination (t/t-1)	Regulating	1.00	1.05	1.05	0.99	0.85	1.16	0.98	0.96	0.96
Nature recreation (t/t-1)	Cultural	1.00	0.99	0.99	0.99	1.04	1.04	1.03	1.20	1.25
Nature tourism (t/t-1)	Cultural	1.00	1.00	1.00	1.05	1.17	1.05	0.90	0.85	1.27

*Table 9: Geometric mean of the sub-indices calculated using the chain method (Index value in year t-1 * GeoMean interannual change year t). For provisioning services in 2014 this is calculated as the sub-index value in 2013 * Geometric mean of the inter annual change in provisioning services in 2014: 1 * GeoMean (1.110311; 1.087256; 0.980873; 1.223955) = 1.020994. The overall index following the two-step approach is calculated in the same way from the three sub-indices.*

Chain method	ES category	2013	2014	2015	2016	2017	2018	2019	2020	2021
Geometric Mean (sub-index)	Provisioning	1.00	1.02	0.99	0.94	1.05	0.91	0.88	0.86	0.86
Geometric Mean (sub-index)	Regulating	1.00	1.00	0.97	0.96	0.93	0.98	0.95	0.92	0.91
Geometric Mean (sub-index)	Cultural	1.00	1.00	0.99	1.01	1.12	1.17	1.13	1.14	1.44
Geometric Mean of Sun-Indices (index - 2step approach)	B.1 - All	1.00	1.01	0.98	0.97	1.03	1.02	0.98	0.96	1.04

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9.2 Disaggregating the indicator

The optional disaggregations for Indicator B.1, as reflected in Annex II of CBD Decision 16/31 on the monitoring framework, are:

- By type of ecosystem service,
- By realm, biome and ecosystem functional group (Global Ecosystem Typology levels 2 and 3 or equivalent),
- By Indigenous and traditional territories.

The metadata mentions that it may be possible to disaggregate the indicator by type of user (business, households and government – the economic units typically included in ecosystem services accounts), but this was not included in CBD Decision 16/31 and is not addressed further in these Compilation Guidelines.

Countries may want to disaggregate the indicator in a range of other ways for use at the national or sub-national level. For example, it could be disaggregated by sub-national areas that have policy relevance, such as provinces, states, municipalities, catchments or marine zones. More detailed disaggregation by ecosystem types at a finer level than ecosystem functional groups, or by other ecosystem categories or classes, may be useful to support national and sub-national policy and decision-making.

Disaggregating by type of ecosystem service

For disaggregation by type of ecosystem service, the primary intention is to disaggregate Indicator B.1 by the three broad categories of ecosystem services (provisioning, regulating and cultural), so that trends across them can be compared. This disaggregation is built into the two-step process for deriving the overall index explained in Section 9.1, and is represented by the three sub-indices.

An additional intention may be to disaggregate by other groupings of ecosystem services or by specific individual ecosystem services, for example to support use of the indicator for Target 11. Countries may wish to identify additional groupings of ecosystem services that have policy relevance and disaggregate the indicator to these (e.g., services that are particularly important for low-income households, services that contribute to water security or disaster risk management), or individual services that are of policy relevance.

These additional disaggregations would involve deriving the indicator just for the subset of the ecosystem services of interest. Trends in those services could then be compared and contrasted with trends in the indicator as a whole and/or the three sub-indices.

Disaggregating by realm, biome and ecosystem functional group

For the disaggregation “by realm, biome and ecosystem functional group”, the preferred option is to disaggregate the indicator by ecosystem functional group (Global Ecosystem Typology level 3), for reasons set out in the CBD’s revised guidance for using the indicators of the monitoring framework

(CBD/COP/16/INF/3/Rev.1) and recapped briefly in Section 4.3. The second-best option is to disaggregate the indicator by biome (Global Ecosystem Typology level 2), and the third-best option is to disaggregate by realm (Global Ecosystem Typology level 1). If disaggregation by ecosystem functional group or biome is possible, this will automatically mean that disaggregation by realm is also possible, as ecosystem functional groups and biomes nest within realms.

This disaggregation would require that the indicator is derived separately for each ecosystem functional group/biome/realm, so that trends for specific ecosystem functional groups/biomes/realms could be compared with each other and with the overall indicator and sub-indices.

A further option could be to derive the indicator for certain priority ecosystem functional groups or biomes of particular policy interest, for example to reveal trends in ecosystem services from M1.3 Photic Coral Reefs, or M1 Marine Shelf biome.

Disaggregating by Indigenous and traditional territories

Disaggregation by Indigenous and traditional territories may have high policy relevance in some countries, especially those where Indigenous lands and traditional territories have been formally recognised. It may also support important insights into the role of Indigenous territories and traditional governance systems in maintaining ecosystems and associated ecosystem service flows, which may reflect territorial governance systems, management practices and long-term human-nature relationships associated with those territories. However, this disaggregation may not be appropriate or useful all contexts, and a range of social, cultural and political factors would likely need to be considered. The decision to undertake such a disaggregation should be made in partnership with Indigenous Peoples and local communities (IPLCs).

This disaggregation would involve quantifying the portion of each ecosystem service flow that is spatially linked to Indigenous and traditional territories, compiling an ecosystem services account (at least the interim option shown in Table 6In practice, it can be challenging to attribute the provision of an ecosystem service to particular ecosystem types, as discussed in section 7.3. In cases where it is possible to do this for some ecosystem services but not others, the supply table could provide the breakdown by ecosystem type for some ecosystem services and for others just give the total in the final column.

As an interim option, the table could show just the total quantity of each ecosystem service supplied, i.e. with no information about ecosystem types or users. At least two time points would be needed to calculate the indicator. See Table 6 for an example.

Table 6) using just those portions, and then deriving the indicator based on that account. In this context, spatially linked implies the ecosystem service is supplied by ecosystems within Indigenous and traditional territories or is used by communities within those territories. Trends in ecosystem service flows linked to Indigenous and traditional territories could then be compared with trends for the country as a whole, potentially providing additional insight into the contribution of Indigenous

territories and traditional management systems to ecosystem maintenance and ecosystem service provision.

If this disaggregation is to be undertaken, it requires:

- Respect for national legal frameworks,
- Free, prior, and informed consent (FPIC) of the communities involved, and their participation in the process,
- Respect for Indigenous data sovereignty principles, including appropriate governance, control and use of data related to Indigenous Peoples and traditional territories,
- Alignment with guidance from the CBD Working Group on Article 8(j) to ensure respect for rights and cultural values,
- Reliable spatial boundaries for Indigenous and traditional territories.[6]

If any of these requirements is not met, it is not recommended to undertake this disaggregation.

10 Step 5. Reporting on the indicator

This section provides guidance for national reporting on Indicator B.1 as part of countries' National Reports via the CBD's Online Reporting Tool, including the reference period and baseline for the indicator, which years to report on, and reporting items and units. It does not provide guidance on the inter-institutional processes through which values are reviewed, agreed and approved for reporting, as these should be determined at the national level involving the relevant ministries and technical entities.

Based on CBD Decisions and related documents, the reference period for reporting and monitoring progress in the implementation of the GBF is the period 2011-2020, allowing for some flexibility in the years for which countries compile and report on reference values for the indicators. The reference period does *not* imply that a multi-year mean should be calculated for the decade 2011-2020 but rather than there is flexibility to report values for a year within that decade if values for 2020 are not available. The CBD's guidance on the monitoring framework clarifies that headline indicators will be reported in tabular format, ideally with values for 2020 and more recent years. It notes that historical trends are relevant, suggesting that where possible the time series for which indicators are compiled and reported should also include values prior to 2020.

In the context of Indicator B.1, it is useful to distinguish between the GBF reference period of 2011-2020 and a country's national baseline date for the indicator, which could be earlier than the global reference period. For Indicator B.1 *countries are encouraged to submit data for all the years for which they have data*, from as far back as possible to as recently as possible. This should include all the accounting periods for which they have compiled accounts, whether published or preliminary.

Encouraging countries to report data for all years for which they have data allows flexibility for the indicator to be aggregated globally with a reference period of 2011-2020, while not losing valuable

[6] Indigenous territories may be well defined in practice but not formally demarcated or recognised in law. Community-defined boundaries developed, for example, through participatory mapping with FPIC and documented methodology, can constitute reliable spatial boundaries for the purpose of this disaggregation.

information about longer term trends where it is available. Collecting data for years prior to the global reference period from countries that have such data could enable additional analyses that may be useful.

Countries should report absolute values in biophysical units for all years available for each ecosystem service they have included in the indicator. This will enable the indicator to be calculated at the regional and global level, to complement national reporting on the indicator. Table 10 shows the structure of the reporting template for Indicator B.1.

Table 10: Structure of the reporting template for Indicator B.1, showing data to be collected

Indicator	Does this data row represent a disaggregation	Disaggregation type	Disaggregation	Year	Unit	Value	Footnote
B.1 Services provided by ecosystems	No	Not applicable	Not applicable				
B.1 Services provided by ecosystems	Yes	Ecosystem service type	Provisioning services				
B.1 Services provided by ecosystems	Yes	Biome - Global Ecosystem Typology level 2	T1 Tropical-subtropical forests biome				
B.1 Services provided by ecosystems	Yes	Ecosystem Functional Group - Global Ecosystem typology level 3	T2.6 Temperate pyric sclerophyll forests and woodlands				
B.1 Services provided by ecosystems	Yes	Indigenous and traditional territories	[Please describe]				
B.1 Services provided by ecosystems	Yes	Other	[Please describe]				

Global aggregation of Indicator B.1 will also use a geometric mean of trends, consistent with the intent and rationale for the indicator. Detail on how this will be implemented is beyond the scope of these Compilation Guidelines and fall within the domain of the Global Review of Collective Progress in the Implementation of the Kunming-Montreal Global Biodiversity Framework, undertaken as part of the mechanisms for planning, monitoring, reporting and review of the Framework.

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11 Related resources

Below is a list of resources that are directly relevant to developing Indicator B.1 with short notes on their content and relevance.

11.1 Reference materials

Metadata for indicator B.1 (https://www.gbf-indicators.org/metadata/headline/B-1)

- Outlines the rationale, definitions, concepts and classification, method of computation, accessibility of the methodology and data sources, and recommended disaggregations of the indicator.
- Provides the basis for the Compilation Guidelines for Indicator B.1.

➔ Relevant to all aspects of Indicator B.1.

SEEA Ecosystem Accounting (UN et al., 2024)

- Provides the international statistical standard for ecosystem accounting, adopted by the United Nations Statistical Commission in 2021.
- Organises ecosystem information using an accounting approach, enabling data from multiple sources to be compiled consistently over time and linked to economic and social information.
- Establishes the concepts, definitions and accounting structure that underpin Indicator B.1, including ecosystem assets, ecosystem services, ecosystem service flows and ecosystem service supply and use tables.
- Chapter 6 discusses ecosystem services concepts and classifications, Chapter 7 ecosystem services accounts, and Chapter 14 the derivation of indicators from ecosystem accounts.
- Provides a reference list of ecosystem services for use in ecosystem accounting, grouped into provisioning, regulating and maintenance, and cultural services. Supports a common approach to identifying, classifying and reporting ecosystem services, while retaining flexibility through "other" categories that allow countries to incorporate additional services reflecting national priorities, knowledge systems and policy needs.
- Recommends the use of ecosystem classifications aligned with the IUCN Global Ecosystem Typology.

➔ Relevant particularly to the concepts and classifications described in Part A, and to Steps 2, 3 and 4 of the process for compiling Indicator B.1.

IPBES Methodological Assessment of the Diverse Values and Valuation of Nature (IPBES, 2022)

- Explores instrumental, relational and intrinsic values of nature and the diversity of ways in which nature is understood and valued across societies, cultures and knowledge systems.
- Highlights the importance of recognising diverse value perspectives in policy and decision-making, including those of Indigenous Peoples and local communities.
- Discusses approaches for recognising and integrating diverse values of nature into policy, governance and decision-making.

➔ Relevant to the rationale for Indicator B.1, including the discussion of diverse value perspectives in Section 2, and to the selection and interpretation of ecosystem services for Indicator B.1.

IUCN Global Ecosystem Typology: Descriptive profiles for biomes and ecosystem functional groups (Keith et al., 2020)

- The primary reference for understanding the Global Ecosystem Typology, including definitions of realms, biomes and ecosystem functional groups.
- Presents the Global Ecosystem Typology 2.0, provides detailed descriptive profiles for all biomes and ecosystem functional groups, including their defining characteristics, ecological drivers, and relationships to biodiversity and ecosystem functioning.
- Supported by the Global Ecosystem Typology website (see below).

➔ Relevant particularly to concepts and classifications, attributing ecosystem service flows to ecosystem types in Step 2, and disaggregating the indicator in Step 4 for Indicator B.1.

Guidelines for developing national ecosystem maps (Global Ecosystems Atlas, 2026) https://doi.org/10.60566/cd13v-0me13

- Developed for the Global Ecosystems Atlas, an initiative convened by the Group on Earth Observations with a range of partners, including the Secretariat of the CBD.
- Addresses the development of country-wide national ecosystem maps, a foundational data product for GBF Indicators A.2 and B.1 as well as the conservation, management, restoration and monitoring of ecosystems more broadly.
- Identifies key considerations and provide a framework that can be adapted to different country contexts, recognising that there is no single recipe for developing a national ecosystem map, whether from a technical or institutional perspective.
- Covers the importance and applications of national ecosystem maps, core concepts for mapping and classifying ecosystems, the suite of products that make up a national ecosystem map, typical phases involved in developing a national ecosystem map, roles and skills required in ecosystem mapping teams, and institutional and social processes to consider.
- Applies across realms, including terrestrial, freshwater and marine and transitions between them, and cover natural and anthropogenic ecosystem types.
- Does not provide detailed technical guidance on mapping and classifying ecosystems, but rather to point to some high-level principles and approaches in this rapidly advancing field.

➔ Relevant particularly to concepts, classifications, and Step 2 for Indicator B.1.

IUCN Standards, methods and guidelines for cross-referencing ecosystem classifications and maps to the IUCN Global Ecosystem Typology (IUCN, 2025)

- Provide a standardised approach for cross-referencing national, regional and other ecosystem classifications to ecosystem functional groups (EFGs) in the Global Ecosystem Typology.
- Developed to support the use of the Global Ecosystem Typology as a common global reference framework while maintaining the integrity and detail of national ecosystem classifications and maps.
- Explains the conceptual basis for cross-referencing and sets out four key principles: comparison of like classifications, assessment of group membership based on ecosystem properties, use of a weight-of-evidence approach, and explicit representation of uncertainty.
- Provides a five-step protocol for cross-referencing ecosystem types to EFGs, including assessing alignment with the ecosystem concept, compiling information on ecosystem properties,

identifying plausible candidate EFGs, estimating membership values and documenting uncertainty through a structured synthesis process.

- Includes practical tools and templates, including a membership matrix for documenting relationships between national ecosystem types and EFGs, guidance on structured expert elicitation, and discussion of emerging digital and artificial intelligence tools to support cross-referencing.

➔ Relevant particularly to Steps 2 and 3 for Indicator B.1.

Guidelines on biophysical modelling for ecosystem accounting (UN, 2022)

- Provides guidance on the use of biophysical modelling to support SEEA Ecosystem Accounting, including ecosystem extent, condition and ecosystem service accounts.
- Introduces a tiered approach to account compilation, ranging from the use of globally available datasets and models through to nationally and locally customised approaches.
- Describes practical considerations for implementing ecosystem accounting, including institutional arrangements, stakeholder engagement, data sharing, software, technical skills and quality assurance.
- Reviews a range of spatial datasets, remote sensing products, modelling techniques and modelling platforms that can support ecosystem accounting.
- Discusses the quantification of ecosystem services within the SEEA Ecosystem Accounting framework, including methods for estimating ecosystem service flows, linking services to ecosystem assets, and developing ecosystem service datasets suitable for ecosystem services accounts.

➔ Relevant particularly to Steps 0, 2 and 3 of the process for compiling Indicator B.1.

The CBD's *Revised guidance on using the indicators of the monitoring framework of the Kunming-Montreal Global Biodiversity Framework* (CBD/COP/16/INF/3/Rev.1, October 2024)

- Provides guidance developed by the CBD Ad Hoc Technical Expert Group on Indicators to support the implementation, interpretation and reporting of indicators in the GBF monitoring framework.
- Includes guidance on monitoring ecosystems across the GBF and the role of ecosystem-related indicators in supporting implementation of the ecosystem approach.
- Recommends the IUCN Global Ecosystem Typology as a common global reference framework for ecosystem-related reporting, while emphasising that national ecosystem classifications and maps remain the primary basis for national planning, monitoring and reporting.
- Explains that national ecosystem classifications can be cross-referenced to ecosystem functional groups (level 3) of the GET to support consistent reporting and disaggregation of ecosystem-related indicators across countries and across the GBF monitoring framework.
- Discusses the role of ecosystem classifications and maps in supporting ecosystem-related headline indicators, including A.1 Red List of Ecosystems, A.2 Extent of natural ecosystems, B.1 Services provided by ecosystems, 2.1 Area under restoration and 3.1 Coverage of protected and conserved areas.
- Provides guidance on the rationale for reporting and analysing ecosystem-related indicators using ecosystem functional groups, and on the links between ecosystem-related actions, such as restoration and protection, and ecosystem outcomes.

➔ Relevant particularly to Steps 1, 2, 4 and 5 for Indicator B.1.

Eurostat's Ecosystem Accounts Handbook (Eurostat, 2026)

- Provides practical guidance for compiling ecosystem accounts within the SEEA Ecosystem Accounting framework, with a primary focus on implementation in the European Statistical System.
- Expands on methodological and operational aspects of ecosystem accounting that are only addressed at a high level in SEEA Ecosystem Accounting, drawing on experience gained through implementation of ecosystem accounts in Europe.
- Includes detailed guidance on ecosystem services accounts, covering concepts and definitions, ecosystem service classifications, accounting tables, ecosystem service supply and use, spatial attribution of ecosystem service flows, and the compilation of ecosystem services accounts in biophysical and monetary terms.
- Includes detailed guidance on ecosystem services accounts, covering concepts and definitions, ecosystem service classifications, accounting tables, ecosystem service supply and use, spatial attribution of ecosystem service flows, and the compilation of ecosystem services accounts in biophysical and monetary terms.
- Discusses methods for quantifying and mapping ecosystem services, including the estimation of ecosystem service flows, linking services to ecosystem assets, and developing ecosystem service datasets suitable for accounting purposes.
- Discusses practical issues that arise in compiling ecosystem services accounts, including the measurement of ecosystem service flows, attribution of services to ecosystem types, treatment of beneficiaries and users, data consistency over time, uncertainty assessment, and quality assurance.
- Provides examples of accounting workflows, reporting formats, validation procedures and quality-control checks that can support the development of robust ecosystem services accounts.
- Although developed primarily for the European context and based on European ecosystem typologies, datasets and reporting requirements, many of the practical considerations and compilation approaches are relevant more broadly to ecosystem services accounting.

➔ Relevant particularly to Steps 2 and 3 for Indicator B.1.

SEEA Ecosystem Accounting Implementation Guide: *Towards the Institutionalization of the SEEA: Implementation Guide* (UNSD, 2023)

- Provides practical guidance to support countries in implementing and institutionalising the SEEA Central Framework and SEEA Ecosystem Accounting.
- Focuses on country-level implementation processes, including strategic planning, stakeholder engagement, national assessments, account prioritisation and implementation planning.
- Discusses institutional, governance and coordination mechanisms that can support the regular production and use of environmental-economic accounts.
- Includes guidance on compiling accounts, identifying data sources, establishing technical working arrangements, quality assurance, dissemination and communication of account results.
- Provides examples from country implementation experiences and highlights a flexible and phased approach to developing environmental-economic accounts.

- Designed as an online resource that can be consulted selectively, depending on a country's stage of implementation and priorities.

➔ Relevant particularly to Step 0 for Indicator B.1, with additional relevance to Steps 2 and 3.

11.2 E-learning resources

SEEA e-learning resources | System of Environmental Economic Accounting

The SEEA e-learning resources provide introductory and intermediate training on the SEEA, including SEEA Ecosystem Accounting. They are particularly useful for building foundational knowledge of ecosystem accounting concepts, accounts and applications, and may support capacity development throughout the process of compiling Indicator B.1. The resources may be especially helpful for institutions and individuals who are new to ecosystem accounting or who require a broader understanding of the accounting framework that underpins the indicator.

11.3 Online platforms and tools

Indicators for the Kunming-Montreal Global Biodiversity Framework | Indicator Repository
The GBF Indicator Repository provides access to the official metadata and supporting documentation for the indicators of the Kunming-Montreal Global Biodiversity Framework. For Indicator B.1, it is the primary source for the current indicator metadata and any subsequent updates adopted through CBD processes.

Global Ecosystem Typology
The Global Ecosystem Typology website provides access to the IUCN Global Ecosystem Typology, including descriptions of realms, biomes and ecosystem functional groups, supporting documentation, scientific publications, and technical guidance. For Indicator B.1, it may be relevant to Step 2 where countries attribute ecosystem service flows to ecosystem types or groups, and is relevant to disaggregating the indicator in Step 4.

ARIES for SEEA | System of Environmental Economic Accounting
ARIES for SEEA is a platform that supports the compilation of ecosystem accounts using the SEEA framework. It combines Earth observation data and environmental models to help generate spatially explicit ecosystem extent, condition and ecosystem service accounts. For Indicator B.1, it may be useful in Steps 2 and 3, particularly where countries are seeking an interim approach to account compilation while national ecosystem accounting datasets and systems are being strengthened. To support countries in the compilation of Indicator B.1, global datasets for four ecosystem service are being developed on the ARIES for SEEA platform: global climate regulation services, grazed biomass provisioning, coastal protection services and nature-based tourism.

Integrated Natural Capital Accounting (INCA) Platform (of the European Commission)
The INCA Platform provides access to ecosystem accounts, datasets, methodologies and tools developed by the European Commission to support implementation of SEEA Ecosystem Accounting. It includes ecosystem services accounts and supporting methods for quantifying, mapping and accounting for ecosystem services. For Indicator B.1, it may be useful in Steps 2 and 3, particularly as

a source of methodological examples and practical approaches to developing ecosystem service datasets and ecosystem services accounts. Although developed primarily for Europe, many aspects are relevant beyond the European context.

Global Knowledge Support Service for Biodiversity

The Global Knowledge Support Service for Biodiversity is a capacity-development and knowledge-sharing platform established to support implementation of the Kunming-Montreal Global Biodiversity Framework. It provides access to guidance, learning resources, tools, communities of practice and technical support related to biodiversity monitoring, reporting and implementation. For Indicator B.1, it may be useful across all stages of the compilation process, particularly for accessing training materials, technical guidance, examples from other countries and opportunities for peer learning related to ecosystem accounting and GBF reporting.

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Glossary

Anthropogenic ecosystem types	Ecosystem types created and maintained through human interventions, where human interventions are the primary determinant of the composition, structure and functioning of the ecosystem. Typically replace a pre-existing or antecedent natural ecosystem type, which is no longer recognisably present (although small patches/fragments and some native species may persist). Contrast with *Natural ecosystem types*.
Biome	A component of a realm, united by one or a few common major ecological drivers that regulate major ecosystem functions and ecological processes. Level 2 of the Global Ecosystem Typology. (Typology - Global Ecosystem Typology)
Cultural services	Experiential and intangible services related to the perceived or actual qualities of ecosystems whose existence and functioning contribute to a range of cultural benefits (SEEA Ecosystem Accounting, paragraph 6.51).
Ecosystem	A dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit (Article 2 of the CBD).
Ecosystem Accounting Area	The geographical territory for which an ecosystem account is compiled (SEEA Ecosystem Accounting, paragraph 2.12).
Ecosystem asset	A contiguous space covered by a specific ecosystem type characterised by a distinct set of biotic and abiotic components and their interactions (SEEA Ecosystem Accounting, paragraph 2.11). Also see *Ecosystem occurrence*.
Ecosystem condition	The quality of an ecosystem measured in terms of its abiotic and biotic characteristics. Condition is assessed with respect to an ecosystem's composition, structure and function which, in turn, underpin the ecosystem integrity of the ecosystem (SEEA Ecosystem Accounting, paragraph 2.13). Sometimes referred to as ecological condition. Broadly equivalent meaning to ecosystem integrity.
Ecosystem functional group	A group of related ecosystem types within a biome that share common ecological drivers and ecosystem properties. Level 3 of the Global Ecosystem Typology. (Typology - Global Ecosystem Typology)
Ecosystem services	The contributions of ecosystems to the benefits that are used in economic and other human activity (SEEA Ecosystem Accounting, paragraph 2.14).
Ecosystem service flows	Realised flows between ecosystem assets and the economic units that use the services (such as households, businesses, or governments). In accounting, the actual ecosystem service flow is recorded, rather than the capacity or potential for an ecosystem to supply a service.

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Ecosystem services account	Records the flows of ecosystems services over an accounting period, with the supply of each service allocated to different ecosystem types and the use of each service allocated to different economic units (SEEA Ecosystem Accounting, Chapter 7).
Ecosystem services mapping	The process of allocating the supply and use of ecosystem services to locations (SEEA Ecosystem Accounting, paragraph 7.66).
Ecosystem type	A type of ecosystem distinguished from other types by its characteristic functional, structural and compositional properties (IUCN, 2025). Identified and delineated as part of a hierarchical classification system, typically at a detailed level of the classification equivalent to level 5 or 6 of the Global Ecosystem Typology.
Ecosystem occurrence	An individual occurrence of an ecosystem type. Referred to as an *ecosystem asset* in SEEA Ecosystem Accounting.
GBF Indicator B.1	The trend in the flows of a set of ecosystem services in a particular time period compared to a baseline year, for a country or globally (Metadata for Indicator B.1). The indicator takes the form of an index of change in ecosystem services, with three sub-indices for provisioning, regulating and cultural services.
Global Ecosystem Typology	A hierarchical framework for identifying and classifying the Earth's ecosystem types across the terrestrial, subterranean, freshwater and marine realms and transitions between them (Keith et al., 2020; Keith et al., 2022).
Mutually exclusive and collectively exhaustive	In the context of ecosystem classification and accounting, means that the classification covers all ecosystem types within the country, without any conceptual overlaps between ecosystem types, and the associated map represents these ecosystem types without any spatial gaps or overlaps.
Modified natural ecosystem	Ecosystems influenced or modified by human interventions, but with natural compositional, structural and functional characteristics of the natural ecosystem type still at least partially present and recognisable. Modified natural ecosystems are encompassed within *Natural ecosystem types*, and in some contexts they may be referred to as semi-natural. Contrast with *Anthropogenic ecosystem types.*
National ecosystem classification	Distinguishes between different ecosystem types present in a country, preferably as part of a hierarchical classification system. Typically accompanied by spatial datasets or maps of the distribution of the ecosystem types, with classification and mapping often taking place iteratively.
National ecosystem map	Shorthand for a classification and map of the spatial distribution of ecosystem types in a country. The map shows the spatial distribution (geographic locations) of the ecosystem types that occur in the landscape or seascape, and the classification provides a hierarchy that differentiates ecosystems at different levels, with

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	names and descriptions of distinct ecosystem types. (Global Ecosystems Atlas, 2026)
Natural ecosystem types	A broad category of ecosystem types, contrasted with anthropogenic ecosystem types. Includes: Ecosystems influenced or modified by human interventions, but with natural compositional, structural and functional characteristics still at least partially present and recognisable; and, instances or occurrences of natural ecosystem types that are in a range of condition states, from pristine ecosystems in excellent condition or with high integrity, through to those in poor condition or with low integrity. Also see *Anthropogenic ecosystem types*, *Modified natural ecosystems*.
Preliminary ecosystem services account	An ecosystem services account not yet formally approved and published by the national statistical office. May be compiled using a simplified form of the SEEA ecosystem services account table (see Table 5). At a minimum, it should be confirmed through an expert-based validation process involving relevant national experts and other relevant knowledge holders.
Provisioning services	Those ecosystem services representing the contributions to benefits that are extracted or harvested from ecosystems (SEE Ecosystem Accounting, paragraph 6.51).
Realm	One of five major components of the biosphere that differ fundamentally in ecosystem organisation and function: terrestrial, freshwater, marine, subterranean, atmospheric, and combinations of these (transitional realms). Level 1 of the Global Ecosystem Typology. (Typology - Global Ecosystem Typology)
Regulating and maintenance services (often shortened to regulating 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 (SEEA Ecosystem Accounting, paragraph 6.51).
Sustainability ratio	The proportion of an ecosystem service flow in a particular accounting period that is estimated to be sustainable, calculated as the sustainable flow divided by the actual flow. A sustainability ratio of 1 means that the actual flow of the ecosystem service is considered to be sustainable, while a sustainability ratio of less than 1 means that the actual flow is considered unsustainable.
Unsustainable use flag	If the sustainability ratio for an ecosystem service is less than 1, that ecosystem service gets an unsustainable use flag, providing complementary information for interpreting trends in Indicator B.1

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References

Buckland, S.T., Studeny, A.C., Magurran, A.E., Illian, J.B. and Newson, S.E. 2011. The geometric mean of relative abundance indices: a biodiversity measure with a difference. *Ecosphere*, *2*(9), pp.1-15.

Collen, B.E.N., Loh, J., Whitmee, S., McRAE, L.O.U.I.S.E., Amin, R. and Baillie, J.E. 2009. Monitoring change in vertebrate abundance: the Living Planet Index. *Conservation Biology*, *23*(2), pp.317-327.

Driver, A. & Botts, E.A. (Eds.) (2025). *Guidelines for classifying agricultural and plantation forestry ecosystems in the IUCN Global Ecosystem Typology*. IUCN, Gland, Switzerland (especially Section 4 Key Concepts and Terms)

Driver, A. & Botts, E.A. (Eds.) 2026. *Synergies between the IUCN Red List of Ecosystems and SEEA Ecosystem Accounting*. IUCN, Gland, Switzerland.

Eurostat. 2024. *Guidance note on ecosystem services accounts*. Technical note, December 2024. Eurostat, Luxembourg.

IPBES. 2022. Methodological Assessment Report on the Diverse Values and Valuation of Nature of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services. Balvanera, P., Pascual, U., Christie, M., Baptiste, B., & González-Jiménez, D. (Eds.). IPBES secretariat, Bonn, Germany. https://doi.org/10.5281/zenodo.6522522

IUCN. 2025. *Standards, methods and guidelines for cross-referencing ecosystem classifications and maps to the IUCN Global Ecosystem Typology*. Version 1.0. Keith, D. A., Dayaram, A., Driver, A., Ferrer-Paris, J. R., Francis, R., Hay, S., Murray, N. J., Nicholson, E., Santos, J., Skowno, A. L. & Tozer, M. G. (Eds.). IUCN, Gland, Switzerland.

Keith, D.A., Rodríguez, J.P., Brooks, T.M., Burgman, M.A., Barrow, E.G., Bland, L., … & Spalding, M.D. 2015. The IUCN Red List of Ecosystems: motivations, challenges, and applications. Conservation Letters 8(3), 214–226. https://doi.org/10.1111/conl.12167

Keith, D.A., Ferrer-Paris, J.R., Nicholson, E. & Kingsford, R.T. (Eds.) 2020. The IUCN Global Ecosystem Typology 2.0: Descriptive profiles for biomes and ecosystem functional groups. IUCN, Gland, Switzerland. https://portals.iucn.org/library/node/49250 1771 1772

Keith, D.A, Ferrer-Paris, J.R., Nicholson, E. et al. 2022. A function-based typology for Earth's ecosystems. *Nature* 610, 513-518, doi:10.1038/s41586-022-05318-4.

La Notte, A., Vallecillo, S., Garcia-Bendito, E., Grammatikopoulou, I., Czùcz, B., Ferrini, S., Grizzetti, B., Rega, C., Herrando, S., Villero, D., Zurbarán-Nucci, M. & Maes, J. 2021. Ecosystem Services Accounting – Part III – Pilot accounts for habitat and species maintenance, on-site soil retention and water purification, EUR 30856 EN, Publications Office of the European Union, Luxembourg, doi:10.2760/636621, JRC126566.

NCAVES & MAIA. 2022. Monetary valuation of ecosystem services and ecosystem assets for ecosystem accounting: Interim Version 1st edition. United Nations Department of Economic and Social Affairs, Statistics Division, New York.

Nicholson, E. & Traurig, M. Results of testing analyses for Headline Indicator B.1 Services provided by ecosystems. Unpublished report, 1st March 2024.

Noss, R.F. 1990. Indicators for monitoring biodiversity: A hierarchical approach. *Conservation Biology*, 4: 355-364. https://conbio.onlinelibrary.wiley.com/doi/abs/10.1111/j.1523-1739.1990.tb00309.x

Obst, C. 2019. Measuring Planet A: Connecting the SEEA Central Framework and the SEEA Experimental Ecosystem Accounting. Paper prepared for the London Group meeting on Environmental-Economic Accounting, Melbourne, Australia, October 2019.

United Nations. 2022. *Guidelines on biophysical modelling for ecosystem accounting*. United Nations Department of Economic and Social Affairs, Statistics Division, New York.

United Nations. 2019. *United Nations National Quality Assurance Frameworks Manual for Official Statistics.* Series M No. 100. United Nations Department of Economic and Social Affairs, New York.

United Nations (UN), European Union, Food and Agriculture Organization of the United Nations, International Monetary Fund, Organisation for Economic Co-operation and Development & World Bank. 2024. System of Environmental-Economic Accounting Ecosystem Accounting. Series F, No. 124. Available at: https://seea.un.org/ecosystem-accounting.

UNEP-WCMC. 2022. Global Ocean Asset Data Guide. A guide for the use of global ocean asset data in ocean accounting. Global Ocean Accounts Partnership and UN Environment Programme World Conservation Monitoring Centre. https://doi.org/10.34892/k4np-ks79

Van Strien. A.J., Soldaat, L.L. & Gregory, R.D. 2012. Desirable mathematical properties of indicators for biodiversity change. *Ecological Indicators* 14: 202–208.

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