DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS
STATISTICS DIVISION
UNITED NATIONS

System of Environmental Economic Accounting

System of Environmental-Economic Accounting— Ecosystem Accounting

Global Consultation on the complete document: Comments Form

Deadline for responses: 30 November 2020
Send responses to: seea@un.org

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Organization & country:	Organizations: Statistics Norway (SSB), Norwegian Environment Agency (NEA), Norwegian Institute of Nature Research (NINA), Norwegian Institute for Water Research (NIVA) Country: NORWAY

The comments form has been designed to facilitate the analysis of comments. There are six guiding questions in the form, please respond to the questions in the indicated boxes below. To submit responses please save this document and send it as an attachment to: seea@un.org.

All documents can be found on our website at: https://seea.un.org/content/global-consultation-complete-draft

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General comments

Question 1: Do you have comments on the overall draft of the SEEA Ecosystem Accounting?

This response from Norway, developed in cooperation between **Statistics Norway (SSB), Norwegian Environment Agency (NEA), Norwegian Institute for Nature Research (NINA), and Norwegian Institute for Water Research (NIVA),** will emphasize that overall, the draft of SEEA EA expresses well the multiple purposes of developing a system of ecosystem accounting. With a spatial and ecological basis, SEEA EA addresses the knowledge needs of nature management, and with its relation to national accounting, the system addresses the knowledge needs of demonstrating nature values consistently related to economic values. The multiple purposes reflect an overarching objective of enhancing the knowledge basis for introducing mechanisms to incorporate values of ecosystems into decision making.

The **Norwegian Environment Agency** recognizes as very positive that the SEEA EA has aligned its work to other relevant international initiatives (e.g. list on page 20) also regarding existing indicator sets (e.g. link to relevant SDG indicators, chapter 14).

Statistics Norway has the understanding that the Norwegian Environment Agency supports that Statistics Norway, as National Statistical Office (NSO), has a coordinating role in further development of the SEEA EA in Norway, in close cooperation with Norwegian Environment Agency and the environmental research institutes.

In principle, **Statistics Norway** agrees with the idea of clearly delineated boundaries for each ecosystem asset. In practical work such boundaries may be difficult to establish.

Norway has established a classification of habitats based on natural gradients, in the system “Nature in Norway” (NiN), https://www.biodiversity.no/Pages/135552/Ecosystems_and_habitats?Key=610 which is relevant on a national level. There is also ongoing work in Norway to define boundaries for the classification of main ecosystems in nature management, and the IUCN typology will be evaluated in this work."

The SEEA EA framework must be flexible enough to permit its application for multiple purposes. In practice, it is important that a common data set can be applied for reporting for different purposes, in order to enhance the knowledge basis for nature management, and to demonstrate nature values related to national accounts, and as satellite accounts for values of ecosystems and ecosystem services.

Norwegian Institute for Nature Research (NINA) will refer to the Nature Index for Norway as suggested biodiversity indicator in the comments both to Chapter 5 (ecosystem condition) and Chapter 13 (biodiversity thematic accounts).

Comments by sets of chapters

Question 2. Do you have comments on Chapters 1-2 of the draft SEEA Ecosystem Accounting?

The **Norwegian Environment Agency** Is currently developing a system for a national mapping of "good ecological condition" and it is of great interest to compare the approach of SEEA EA with the typology of this system. They also consider it very positive that the draft stresses the importance of system "flexibility" to be able to be implemented in different countries and still remain comparable at a global scale despite variation in data availability across countries. The SEEA EA advocates also a collaborative approach at the national level, guaranteed through the establishment of clear roles and responsibilities for compiling the ecosystem account (including "principles of data sharing"). This approach the Agency considers as positive and certainly a point which will be very important to follow up on in every country for successful SEEA EA reporting.

The list in para 1.37 could include mentioning of the ongoing IPBES assessment on values and valuation, which is to be published in 2021-2022. This assessment may provide important background in particular for chapters 6-10 on ecosystem services.

Question 3. Do you have comments on Chapters 3-5 of the draft SEEA Ecosystem Accounting?

Statistics Norway, as comment on **Chapter 3** Spatial units and **Chapter 4** Ecosystem extent, emphasizes that overall, the SEEA EA captures the need to develop ecosystem accounting that with its spatial and ecological basis addresses the knowledge needs of nature management, and with its relation to national accounting, addresses the knowledge need of demonstrating nature values in an economic context. The combination of accounts for ecosystem extent and ecosystem condition allows for an explicit spatial assessment of the basis for ecosystem services. As reflected in the current draft, SEEA EA suggests a flexible approach to spatial units, in contrast to a fixed statistical unit. This is supported by Norway, where extensive nature mapping is prioritized, and nature management also strongly relies on indicators for quality (condition) and representativity of species and ecosystems as basis for assessment of the potential for ecosystem services.

For accounting in urban areas, the definition of ecosystem asset as the basis for accounting is not easy to apply. Land uses and different kinds of urban green areas and trees, identified by remote sensing techniques, are of high interest. It is especially important to link this information to ownership of land and public accessibility, in order to assess availability of ecosystem services.

In addition, the Norwegian Biodiversity Information centre (Artsdatabanken) will launch a national portal for ecological base maps presenting information and background material about spatial information that may be used to assess the extent and condition of terrestrial ecosystems. The use of base maps may allow for a flexible approach to spatial unit, in contrast to a fixed statistical unit, considering that it may be more appropriate to organize the information using statistical units to describe the supply and use of ecosystem services.

Norwegian Environment Agency emphasizes that the framework for delineation and change detecting in spatial ecosystem units, as described in **Chapter 3** "Spatial units for ecosystem accounting" and **Chapter 4** "Accounting for ecosystem extent", in their opinion is good and ambitious and also aligns well with the scientific principles of the Norwegian national habitat description system – Nature in Norway (NiN). Their experience, however, is that actual mapping in accordance with a theoretical system of several gradually changing variables along natural gradients, is challenging. They welcome any development of technical guidance to such mapping (3.63). They would also like to point out the importance of making good consistent standards for data modelling and map production and find the idea of a National Spatial Data Infrastructure (3.83) very interesting and in many ways parallel to strategies already implemented in Norwegian efforts to standardise national geographical data.

The concepts of ecosystem asset and ecosystem type is thoroughly explained, but the use of the two terms throughout the draft could be made clearer and more consistent to avoid confusion.

To compile good examples/best practice of data collecting and management for both large and small EEAs (i.e. from countries, regions to municipalities or just a nature reserve) is pivotal for countries to adopt a system like this, and they would like to see examples included in the text for inspiration and possible future adoption.

4.27: The development of remote sensing techniques in nature mapping makes the application of this framework much more realistic today than only ten years ago, but further development is still needed to operationalize good and consistent nature mapping (delineation and typifying) with remote sensors (i.e. satellite images, laser data etc).

They note that the framework is designed to be flexible both in time and scale. This makes it possible for countries to approach the mapping and accounting both top down (international level) and bottom up (local and national level). They recommend a development of the text further in chapter 3 and 4 to make the distinction between these approaches clearer and provide suggestions to what kind of data is needed to adopt to the one approach or another dependent on existing data in the country.

To exemplify this point: Detailed maps lose information as you zoom out due to minimal area rules of presentation. In many ecosystems, changes from year to year happen on a local scale and the change in extent is important but not extensive. Such important changes will not be detected on yearly basis for big EEAs like countries, because area changes are on a local scale. At the opposite, international datasets produced to cover large areas are not useful for change detection on a local level.

Generally, the accounting period is set to one year. Even though it is acknowledged that time frame for unmanaged expansion and regression may vary considerably, it could be

useful to expand on how to deal with possible meaningful changes that do not result in a change of ecosystem type, (which appears to be what matters for the accounting) but rather in the state of the ecosystem and hence of great management interest.

Norwegian Environment Agency suggests that in further work, Statistics Norway will discuss with Norwegian Institute of Bioeconomy Research (NIBIO), how experiences of NIBIO in mapping of different types of land cover maps and resource maps can be applied in SEEA EA for development of extent and condition accounts.

Norwegian Environment Agency, comments on **Chapter 5** Accounting for ecosystem condition and notices that the suggested SEEA EA framework for overall evaluation of ecosystem condition has clear parallels to ongoing work in Norway on assessing ecological condition, primarily based on the index method. The Nature Index for Norway, https://www.naturindeks.no/,applied to assess status and trends for biodiversity, is also based on an index method, and is clearly relevant for assessment of ecological condition. Both the SEEA EA approach and the index method used in Norway measure the state of an ecosystem by compiling data for indicators that represent different characteristics of ecosystems. This can be done by scaling indicator values to a common scale based on reference levels. There is also correspondence between the two systems, in the range of reference levels, from intact nature to deteriorated nature. The general SEEA EA is thus quite similar to the index method in the Norwegian System for assessing ecological condition, but there are also important differences. Still, Norway has a good point of departure for being able to deliver to this international framework, but there will be need for updated analysis with calculations and qualitative assessments. Also, the index method has been applied on national level for only for few of the main ecosystems in Norway, while for most of the main ecosystems there is need for further development in terms of methods and indicators and/or more nature monitoring data.

Other comments to Chapter 5 from **Norwegian Environment Agency**: Availability of sufficient data can be a large challenge for Norway as for other countries. It would have been useful if the SEEA EA could exemplify suitable and realistic data sets for a set of indicators that could represent a “minimum solution” and yet be considered as sufficient to assess ecosystem condition in the SEEA EA.

There will always be uncertainty related to indicator values and results in an overall assessment of ecosystem condition. This is important information both with regard to how results are used and how gaps of knowledge are identified. It would be useful if the framework to a larger extent could include approaches for accounting for such uncertainties and also for visualizing uncertainties associated with the output, e. g. as intervals around indicator values, as in the Norwegian System for assessing ecological condition.

With regard to Annex 5.1, the draft refers to reference values defined under the EU Water Framework Directive (WFD). The WFD is common for countries in Europe, and it

would be useful if the SEEA EA would consider the relations between the system of the Water Framework Directive, and to a larger extent exemplify how data, indicators etc. from WFD can be applied in the SEEA EA.

Norwegian Institute for Nature Research (NINA) comments on **Chapter 4:**
4.27: New methods for remote sensing and data processing allow for completely new possibilities for developing indicators that in principle can be scale independent, so that SEEA EA can be used for multiple purposes, in addition to national statistics. This approach can be combined with species data in order to define ecosystem condition.

Norwegian Institute for Nature Research (NINA) comments on **Chapter 5:**

Norwegian Institute for Nature Research (NINA) suggests that in Chapter 5 the recently developed system of Index-Based Ecological Condition Assessment (IBECA), drawing on experiences from the Nature Index for Norway, is presented as 'ecosystem condition account'.

NINA here draws upon experiences from developing the Norwegian System for assessing ecological condition. The main conclusion is that Chapter 5 is in well accordance with the Norwegian System. Reflections on indicators, reference condition, reference levels and the broad definition of ecosystem types are similar to the parallel national work in Norway. For natural ecosystems intact nature is defined as nature with low human disturbances and a climate as in the period 1961-1990. The intact ecosystem shall include native species according to this period, i.e. not species composition as in the pre-industrial period. Alien species are excluded in this intact nature. For semi-natural ecosystem, intact nature is defined likewise, except that the ecosystem is maintained by human activity defined as good maintenance to sustain the semi-natural ecosystem. Generally, it is important that the system is stringent, but flexible with respect to delineation of accounting areas and the selection of indicators. For example, the selection of indicators may differ from country to country due to differences in representativity of ecosystem characteristics and data availability. The system also neds to be flexible with regard to purpose.

There are some differences in the definition of ecosystem characteristics between SEEA EA and the Norwegian System, but the Norwegian indicators can easily be reorganized to fit the SEEA EA system when reporting from Norway. There is need for some recalculations on indicators, but it is a feasible task. Norway will however include new indicators in the future, which are currently not available or have not yet been tested.

NINA sees that the flexible approach to area delineating for reporting is necessary for Norway. They will probably focus on a rather rough division of areas (e.g. five main regions for terrestrial ecosystems). However, NINA thinks it is important to improve this spatial resolution of delineated reporting areas, as they need to know where degradation occurs

in order to inform the nature management sector on critical areas for mitigation measures.

NINA is in favour of the new suggestion of indicator aggregation (Figure 5.1.).

A suggestion for improvement of the SEEA EA is to further specify how to account for uncertainty when reporting on indicator values. National level work in Norway on biodiversity and ecosystem condition has developed robust approaches to this, which may provide a good starting point.

Question 4. Do you have comments on Chapters 6-7 of the draft SEEA Ecosystem Accounting?

Norwegian Environment Agency comments on Chapter 6 Ecosystem services concepts for accounting, that the chapter appears well updated on practical and academic developments related to the ecosystem services approach, and it includes open and systematic discussion of important and difficult challenges related to policy, methodology and implementation. This relates for example to methodological and practical challenges in handling abiotic flows (6.2.5 and 6.4.5), links between ecosystem services and biodiversity (6.3.3), treatment of water supply (6.4.2) and treatment of the ecosystem contribution in biomass provision services (6.4.1). The draft is also clear on what could and should - conceptually – be included in ecosystem services accounts. This is also reflected in the generic logic chain presented in table 6.2 and annex 6.1.

They appreciate that the proposal points at what types of ecosystem services that may be included in ecosystem accounts, and at the same time acknowledges that there is much in nature and ecosystems that is important and that falls outside the remit of such accounts.

They welcome the reference list of selected services being presented as providing labels and descriptions for a set of key ecosystem services relevant for ecosystem accounting (para 6.39) and as a pragmatic grouping of ecosystem services to supporting accounting and not as a full ecosystem service classification system (para 6.40). They also welcome referring both to existing classifications systems that are in wide use and to a complete and internationally agreed classification system for ecosystem services that may come.

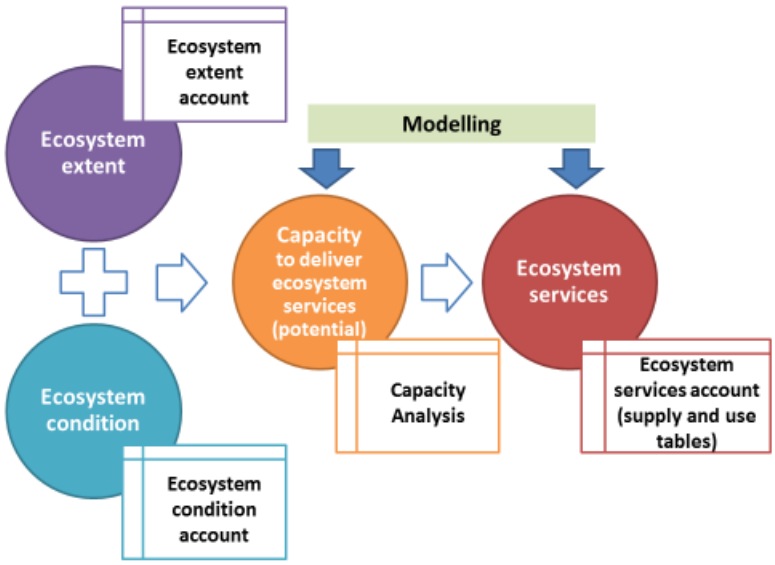
For chapters 6.3.4 on non-use values and/or 6.4.4 on cultural services, reference and possibly a short discussion could be included on the term relational values. This term is used by IPBES, cf. e.g. Díaz et. al 2016, and may be a tool to look at the range of services in the relationship between man and nature. Possible references may include Himes and Muraca 2018 and Arias-Arévalo et. al 2017.

On a more general note, there should be a reference in chapter 6 to the ongoing IPBES assessment on values and valuation, which is to be published in 2021-2022. This assessment may provide important background for future implementation of SEEA EA on ecosystem services, and a reference seems appropriate.

The concept of ecosystem capacity (6.5) is important and conceptually and empirically demanding, and it provides an important link to the accounts on ecosystem extent and condition. For motivation the list in para 6.122 could be supplemented with a bullet on interest in looking at possible policy and management options for an ecosystem, i.e. looking at possible "baskets of ecosystem services". Albeit challenging in practice, they welcome the inclusion of sustainability in the proposed definition of ecosystem capacity (para 6.125),

Statistics Norway's comments on ecosystem capacity: Maybe this concept could be called "the sustainable capacity" in order not to limit the capacity concept. Ecosystem capacity represents the potential of ecosystems to provide current and future ecosystem services, based on current and projected future use of the ecosystems. While capacity is a biophysical characteristic, modelling can be required to integrate extent and condition into a measure of ecosystem capacity, in order to capture how the ecosystem condition as basis for delivery of ecosystem services.

Statistics Norway suggests that the generic logic presented in Table 6.2 should be supplemented by including the following figure adapted from Maes (2018) in order to illustrate a wider interpretation of the ecosystem capacity concept.



Source: Maes J., Teller A., Erhard M., Grizzetti B., Barredo J.I., Paracchini M.L., Condé S., Somma F., Orgiazzi A., Jones A., Zulian A., Vallecilo S., Petersen J.E., Marquardt D., Kovacevic V., Abdul Malak D., Marin A.I., Czúcz B., Mauri A., Loffler P., Bastrup-Birk A., Biala K., Christiansen T., Werner B. (2018). *Mapping and Assessment of Ecosystems and their Services: An analytical framework for ecosystem condition*. Publications office of the European Union.
http://ec.europa.eu/environment/nature/knowledge/ecosystem_assessment/pdf/5th%20MAES%20report.pdf

This demonstrates how the supply and use are linked to extent and capacity through a wider capacity concept. This often will involve modelling, both physical modelling of habitats the link to supply of services. An example could be that of pollination, first to assess the habitats for pollinators, then the location of agricultural fields and semi-natural land suitable for pollinators, then to assess the actual supply and decide which farms that receive the benefits.

Norwegian Environment Agency further comments on **Chapter 7** Accounting for ecosystem services in physical terms, that as far as they can see, the chapter includes open and systematic discussion of challenges related to methodology and implementation. This relates for example to recording and accounting of final and intermediate services, links to relevant abiotic flows and handling exports and imports of ecosystem services.

The chapter presents the methodology behind the supply and use tables in a systematic way, based on the more conceptual discussion in Chapter 6. For readability and references in the text Table 1 could be split in e.g. Table 1a for the supply table and 1b for the use table. The chapter also presents how ecosystem service measurement baselines are needed in ecosystem accounting to ensure consistent quantification of ecosystem service flows in different contexts (7.3.2).

They believe the chapter provides a sound starting point for accounts on ecosystem services in physical terms. However, for many countries the establishment of supply and use tables will be challenging in practice, and the use of pilots and partial accounts may be necessary in an initial phase. In this initial phase it may also be necessary with less detailed specification of individual ecosystem services. If possible, the chapter could include some more discussion on possible minimum requirements for specification of services. They note that different units of measure for different ecosystem services may provide a challenge when the level of detail is increased, and care will have to be taken to avoid double counting.

As for some of the other chapters, it could be useful with annexes and/or references to actual accounts that meet the requirements, in order to supplement hypothetical examples in the text and to give inspiration to countries that are starting up.

Question 5. Do you have comments on Chapters 8-11 of the draft SEEA Ecosystem Accounting?

Statistics Norway: General comments on Chapter 11:
Chapter 11 is well written and provides a useful guideline for possible integration of the SNA and the accounting of ecosystem services and assets in an extended accounting framework, such as extended SUT tables, extended balance sheet accounts, and extended sequence of accounts for institutional units/sectors.

The examples given in the chapter are highly stylized numerical ones and serve well for the purpose of explaining the main ideas. It is almost certain that in the empirical work of compiling such extended accounts, practical issues and challenges will emerge. Therefore,

more country experimental excises should be encouraged in order to identify best practices based on lessons drawn and experiences gained.

Statistics Norway: **Specific comments on Chapter 11:**

1. In Table 11.2 on Page 203, part of the area in the panel of 'Ecosystems services' is marked dark grey, which means that the values in these marked cells are (by definition) zero. However, thinking about foreign tourists paying a visit in a country, their consumption of e.g. cultural services in that country should be registered as export of services from this country being visited to the country from where the foreign tourist come. Therefore, the suggestion is to leave at least these cells for export blank, rather than being marked dark grey.
2. In Paragraph 11.22 on Page 204, 'SNA Chapter 13' is referred, without clear reference to which version it is talking about. The suggestion is to add here a clear reference to the SNA version, i.e. SNA 2008, because, to our knowledge, not all the countries in the world (covered by the United Nations) are using the latest SNA (SNA 2008), even if in the 1993 SNA version, the balance sheet chapter is also 'XIII', literally the same as '13'.
3. In Table 11.3 on Page 206, the suggestion is to add one note, saying that given the mutually exclusivity among the chosen asset classes (i.e. produced, environmental, and other non-produced assets), the domain of the produced assets as shown in this table is not the same as defined in the SNA (e.g. SNA 2008). Another note might also be needed, indicating clearly that in the 'of which' entries, which part is included in the SNA classification (e.g. SNA 2008) and under what asset type, and which part is not. The purpose of the suggestion is to make the table as much user-friendly as possible.

Norwegian Institute for Water Research (NIVA): Comments for Chapter 8-10:
Comment 1:
Table 10.2 in the appendix seems wrongly compared the two NPVs with different starting year. The correct way is to add the NPV values with the same starting year. That is NPV1(t0) adds NPV2(t0) where NPV2 starts at t1 and discounted back to t0.

Comment 2:
EEA has been presented as a tool to monitor the change of the ecosystem and ecosystem services. In Chapter 10, discussion also seems to include the project appraisal and projection of future value of ecosystem service. The use of EEA should be more clearly discussed, distinguishing the monitoring (post evaluation) and project appraisal (pre-evaluation).

Comment 3
There is little discussion on connectivity of ecosystem and ecosystem services among areas in terms of monetary valuation. (Maybe addressed in other Chapters?). For example improvement of ecosystem assets (e.g. more forest cultivated) in area 1 will not only

improve the ES in area 1 but ES in neighbouring area 2. As the assets is not located in area 2, it seems the additional benefits of ES in area 2 will not be recorded.

Comment 4:
Ecosystem accounts: It is problematic to restrain the valuation methods to monetary transactions involving biodiversity related goods and services. It is understandable. While further research needs to be done to understand how this will affect the main purpose of taking ecosystem degradation into economic planning to be achieved in areas where there are few markets exist for ecosystems and with large interest of industry development (e.g. mining). There areas may be with little population and remotely located but rich in nature and ecosystem. Using transaction values will mostly show a very low value of ecosystem services, thus may provide a false picture to justify further development of industries at the cost of ecosystem in these regions.

Norwegian Institute for Nature Research (NINA):
Some issues related to the generalizing of valuation /benefit transfer of ecosystem services within accounting areas might be useful to address early in **Chapters 8 and 9**, as they are major practical issues in monetary valuation. The current positioning of value generalization /benefit transfer issues with spatial variation at the end of **Chapter 9** is more likely to lead to spatial generalization issues – a key innovation in ecosystem accounting – being more likely overlooked for monetary accounts.

Standardization of uncertainty reporting. Generally, it would be useful if the SEEA EA recognizes uncertainty where it is particularly high, such as for monetary value transfer /generalization /benefit transfer. If recognized in the SEEA EA guidance this will be helpful to justify research funding to address the uncertainty.

Institutionalisation of monetary valuation for ecosystem accounting: The SEEA EA should identify a process of institutionalizing monetary valuation methods enabled for spatial value generalization/benefit transfer. It should be clarified that value generalization/benefit transfer using secondary estimates - existing not-fit-for-purpose primary valuation studies - is seen as a tier one approach for early implementation of monetary accounts. The technical details of different tiers of methods could be spelled out in the future NCAVES Guidelines.

Cross-reference the following issues regarding value generalization /benefit transfer in chapters 8 and 9:

8.2 "support: comparing the values of environmental assets (including ecosystems) with other asset types (e.g., produced assets) as part of extended measures of national wealth; assessing the share of ecosystem inputs to production in specific industries and their supply chains; comparing the trade-offs between different ecosystem services; deriving aggregates such as degradation adjusted measures of national income; improved accountability and transparency around the public expenditures on the environment by recognising expenditure as an investment rather than a cost; highlight

the relevance of non-market ecosystem services (e.g., air filtration; provide an information base to support scenario modelling and broader economic modelling; and calibrating the application of monetary environmental policy instruments such as environmental taxes and subsidies"

Comment: The list of purposes does not include evaluating changes in extended measures of national wealth: temporal trends in ecosystem asset degradation or restoration in physical and monetary terms. This is indirectly relevant to value generalization/benefit transfer since the reliability of value generalization/benefit transfer will determine whether significant trend detection is possible.

8.3 "support public awareness of ecosystem related issues, the derivation of performance indicators, benchmarking the activity of industries and sectors, and undertaking general policy framing and analysis "

Comment: As above, although temporal trends are indirectly recognized in performance indicators.

8.7 "The extent to which the alternative valuation methods will provide a good approximation will vary noting that all methods will reflect prices of a partial equilibrium. It is therefore relevant that as much specificity as possible about the location and context of the transaction is incorporated in the application of alternative methods."

Comment: Specificity of location and context apply equally to primary as well as alternative valuation methods. Finding spatial proxies of these conditions that can be mapped in a GIS is key to practical implementation of reliable value generalization /benefit transfer. The importance of the use of GIS for value generalization/benefit transfer to accounting area should be stated early.

It should be useful to reference transfer studies using geospatial variables in the NCAVES guidelines, e.g.:(Brander & Koetse, 2011; Brander et al., 2010; Ghermandi & Nunes, 2013; Johnston et al., 2019; Sen et al., 2014). Examples and reference could be provided in the future NCAVES Guidelines

8.10 "The majority of research and policy on environmentally related monetary valuation, [insert including benefit transfer,] has been conducted with a focus on measuring changes in welfare, for example as part of cost benefit analysis. "

8.21 "All accounting entries are recorded at the respective points in time at their nominal values – i.e., the prices applying at the time of the transaction or balance sheet entry."

Comment: It would be useful with some guidance on the frequency with which value generalization/benefit transfer values should be updated. One may consider similar

practices as for other pricing models used in SNA (e.g. updating models for rental value of homes). This could be further detailed in the future NCAVES Guidelines

8.25 "in ecosystem accounting, ecosystem services are distinguished from the benefits to which they contribute, and hence the focus of valuation is on the contribution of the ecosystem asset (i.e., the input of ecosystem services) and not on the valuation of the benefits"

Comment: To be consistent with 8.25 we should not refer to "benefit transfer" for the purpose of SEEA EA. Use either "value transfer" or "value generalization" in future documents.

8.36 "To measure the expected future returns there are a number of considerations. These include (i) the scope of the returns (i.e., the number of ecosystem services to be included); (ii) the future patterns of flows in physical terms of each ecosystem service taking into consideration expected degradation and patterns of demand; (iii) the expected future prices for each ecosystem service; (iv) the expected institutional arrangements and (v) the expected asset life. Together with the discount rate, all of these factors are combined to yield an estimated NPV for each ecosystem service at a given point in time."

Comment: recognition of accuracy levels in estimating monetary ecosystem asset values is needed in the section on value generalization regarding extrapolating spatially transferred values (from a sample of locations at different historical times) to future prices. This could be further detailed in the future NCAVES Guidelines

8.39 "The description of the NPV approach at the level of an individual ecosystem asset implies the availability of data that can attribute the supply of ecosystem services to that level of detail and hence variations in context and location can be taken into account. In practice, it may not be possible to undertake valuation at this scale and instead valuation by ecosystem type may be required. While the same theory and approach applies at more aggregated scales, care will be needed to ensure that variations between contexts and location are considered, including changes in institutional context."

Comment: Some guidance might be necessary on what is meant with "care". This could be based on the Benefit transfer literature, which provides guidance on documentation of transfer errors. This could be further detailed in the future NCAVES Guidelines

Comment: Institutional context is referred to frequently, but without examples and therefore it might end up being ignored in monetary valuation. Generally, differences in the ability to exclude use and property rights allocations will affect the existence of markets as well as the market price. Specifically, examples of in institutional context such as differences in public or private ownership and access in e.g. fisheries, non-timber forest benefits and recreation could be provided. The GIS mapping of differences in institutional context such as private, public ownership and access would be a key to

value generalization/benefit transfer. This could be further detailed in the future NCAVES Guidelines

8.40 "Nonetheless, there is commonly interest in understanding the relationship between ecosystem asset values and the economic ownership of associated spatial areas – particularly land."

Comment: The importance of ownership (and access rights) for marginal values is recognized here but could be referenced specifically to value generalization/benefit transfer.

8.43 "for analytical purposes, it is standard practice in national accounting to also separate (or decompose) changes in accounting entries recorded at two points in time into changes associated with price and those associated with changes in volumes, reflecting both changes in quantity and quality. Following decomposition, a time series is derived that excludes the effects of price changes, i.e., a time series of changes in volumes. These estimates are commonly referred to as constant price measures."

Comment: The guidance states that constant price measures will be difficult to compute for ecosystem services initially. Constant price measures for ecosystem services are possible but it would be useful with that primary studies used for value generalization/benefit transfer need to be updated periodically.

Comment: "constant price measures" are defined in a temporal sense in national accounts. In ecosystem accounts it should also be recognized that unit value generalization/benefit transfer - unable to adjust for spatial variation in context (income, substitutes, complements, use) - are by default "spatial constant price measures". Spatial patterns in monetary ES maps that form the basis for accounts are entirely driven by physical variation in ecosystem service use. Where unit value generalization/benefit transfer is the only option available because of lacking GIS base maps, accounting purposes might be best addressed using physical ES accounts. The guidelines should be explicit regarding which purposes are unattainable in those cases, e.g. asset accounts.

9.2 "support aggregation of ecosystem services to compare the role of different ecosystem assets, understand changes in monetary value over time, underpin comparison of the inputs of different ecosystem services to different users, and support understanding the role of ecosystem services in different locations, e.g., across countries. "

Comment: the purposes of monetary valuation should be consistent with 8.2. Understanding changes in physical supply-use and monetary value over time is a primary purpose, which places demands on the accuracy of value generalization/benefit transfer.

9.7 "it is important that compilers document the scope of the ecosystem services included in the accounts and highlight ecosystem services that have been excluded from

the scope of measurement and valuation. This is required so that users of the accounts can readily understand and interpret the aggregate measures of the monetary value of ecosystem services. "

Comment: Documenting scope and exclusion of ecosystem services is important to understand the precision/bias of aggregate measures. Documenting the accuracy/variance of value generalization/benefit transfer should be of equal concern, for the purpose of identifying trends in physical and monetary ES supply-use. If lacking standards for reporting accuracy measures or confidence in accounting tables is identified in the SEEA EA it can be used to justify a research agenda to find solutions. If accuracy issues are not mentioned in the guidance they will not be as easily be identified as important by finance and environment ministries, and in turn less likely be resources and funded by national research councils. It would be useful if this was specified in a research agenda/knowledge gaps section.

9.8 "The set of users included in the account is focused on different types of SNA economic units (i.e., businesses, governments, households) that are resident in the EAA."

Comment: it should be recognized that monetary values of ES may vary by type of user because they represent different "institutional contexts" for ES use - different types of ownership and access rights. See comments above regarding institutions. Identifying these differences in monetary use accounts is an unrecognized, but potentially large innovation of ecosystem accounts of importance for policy analysis (PES, land-rent taxation etc). This could be further detailed in the future NCAVES Guidelines

9.12 "Generally, accounting entries for each ecosystem service will be obtained by multiplying a measure of the service flow in quantitative terms by a price estimated using an appropriate method among those described in Section 9.3. Commonly, it will also be necessary to adopt value transfer techniques where an estimated price for an ecosystem service supplied in a sample of locations is applied across multiple locations, taking into account differences in environmental and socio-economic contexts "

Comment: refer to prices (plural) in examples relating to value generalization/benefit transfer. If context differences are accounted for it is likely that prices will vary if locations are different (and the landscape and institutions are heterogenous). It may be relevant to think of location-specific prices or "price scapes" (see Figure 3 MAIA supplement input to NCAVES guidelines). This could be further detailed in the future NCAVES Guidelines.

9.16 "The compilation of the use table in Table 9.1 does not require knowing the location of the user. It is sufficient to record the type of economic unit, whether the unit is resident or non-resident, and the relevant class (e.g., type of industry). Nonetheless, the location of users relative to the location of the supplying ecosystem asset may be of particular interest "

Comment: Confusion of the need to have spatial ES use data and the lack of spatial explicit information in Table 9.1. ES use locations must be known when aggregating up values.

Comment: The importance of location for the policy analysis purposes of ecosystem accounting strongly suggests using GIS maps in reporting. However, the use of GIS for reporting is not mentioned anywhere in the SEEA EA Guidance (only in 3.63 for the purpose of remote sensing extent and condition data management). This then downplays the importance of spatial issues for physical ecosystem services accounts and in turn for value generalization/benefit transfer. It is a substantial methodological gap in the guidelines given the emphasis on spatial variation as a key innovation of SEEA EA to national accounts. This could be further detailed in the future NCAVES Guidelines.

9.21 " Ideally, prices would be estimated for individual ecosystem service flows taking into account the distinct context for supply and use. In practice, it is most likely that such detail cannot be measured on the scale required. As a result, ecosystem accounting will often employ value transfer/benefit transfer techniques in which prices for a particular service in a particular context and accounting periods are applied to estimate prices in other contexts and accounting periods. Methods for value transfer/benefit transfer have also been the subject of much research and development in past decades. Their use in ecosystem accounting is described in Section 9.5."

Comment: With the current limited availability of primary valuation studies, it is true that unit value generalization/benefit transfer will be commonly used in monetary accounts. The implications of this «constant spatial prices measures» could be discussed here or in the future NCAVES Guidelines.

Comment: "constant price measures" are defined in a temporal sense in national accounts. In ecosystem accounts it should also be recognized that unit value generalization/benefit transfer - unable to adjust for spatial variation in context (income, substitutes, complements, use) - are by default "spatial constant price measures". Spatial patterns in monetary ES maps that form the basis for accounts are entirely driven by physical variation in ecosystem service use. Where unit value generalization is the only option available because of lacking GIS base maps, accounting purposes might best be addressed using physical ES accounts. The guidelines could explicitly discuss which purposes are unattainable in those cases, e.g. asset accounts.

9.30 "Notwithstanding this result, the resulting prices should still be applied in ecosystem accounting since the core intent to show accounting entries that reflect the established market context. To the extent that the recorded values are considered "low", there may then be an interest in estimating complementary values on the basis of alternative institutional contexts and market settings. These hypothetical values should

not be recorded in ecosystem accounts but may be presented in complementary accounts (see Chapter 12). “

Comment: It is useful to recognize here that Simulated exchange values (SEV) are estimated based on stated preference valuation scenarios specifying alternative institutional contexts. If SEV are based on hypothetical institutions, then one may consider whether SEV are more relevant for complementary accounts. See 9.50. SEV conducts an ‘institutional transfer’ in order to compute marginal values of recreation. This could be further detailed in the NCAVES Guidelines

9.50 “Simulated Exchange Value (SEV) method. The simulated exchange value method estimates the price and the quantity that would prevail if the ecosystem service were to be traded in a hypothetical market.”[]

Comment: If simulated exchange values are based on hypothetical institutions then one may consider whether SEV are more relevant for complementary accounts.

9.50 “These are used to calculate the price for the ecosystem service that would occur if it was actually marketed. This requires combining the information on the demand function with a supply function and an appropriate market structure (institutional context). “

Comment: By applying an appropriate market structure from another institutional context the (SEV conducts an ‘institutional transfer’ in order to compute marginal values of recreation. (e.g. exclusive access of private property rights ‘transferred/generalized’ to a location that actually has open access and public property rights).

Comment: The potential implications of SEV in computing recreational values of public and community governed lands – in particular in the context of indigenous and local communities – needs to be treated carefully.

9.54 Opportunity costs of alternative uses. “The opportunity cost approach is most useful when considering the ecosystem services that can be linked to certain purposes such as the protection of habitats, cultural or historical sites. The values obtained can be considered exchange values provided that (i) the valuation of the forgone benefits is based on exchange values and (ii) the institutional context considered is sufficiently realistic such that the alternative scenario can be analysed. A primary difficulty with the opportunity costs approach is determining an appropriate alternative use, since depending on the choice made the value of the foregone benefits could vary substantially.”

Comment: The benchmark requirements for “institutional feasibility” should be the same across monetary valuation methods. Standardize the language “realistic” here versus “appropriate” for SEV. This language has implications for the feasible areas over

which values are generalized/transferred (e.g. over a specific types of access and property rights).

Comment: determining “appropriate alternative use” is inextricably linked to the feasibility of the institutional conditions of the alternative use.

Comment: consider including opportunity cost of time as one of the “opportunity cost” approaches that could be used for recreation services, e.g. where institutional feasibility of SEV was not satisfied. This could be further detailed in the future NCAVES Guidelines

Table 9.2
Highlight value generalization/benefit transfer as applying to all methods in Table 9.2

9.68 “The discussion of monetary valuation for ecosystem accounting is focused on the development of estimates in monetary terms for large regions or countries that may be used for the development, implementation and/or monitoring of public policy. “

Comment: It would be useful to ensure that purposes of accounting mentioned here are consistent with chapter 8. The reference to “monitoring public policy” here refers to evaluating trends which is absent from purposes in chapter 8, and relevant for the discussion of required accuracy of valuation generalization/benefit transfer.

“Consequently, much data on the monetary value of ecosystem services is fragmented, covering only specific services over a large area, or multiple services in a more confined area, or valuing changes in the flow of ecosystem services following a specific event.”

“In general, care must be taken when monetary values for ecosystem services or ecosystem assets are applied in other areas. “

Comment: specify what is needed to document “ care” in value generalization/benefit transfer. As argued above transfer error and reliability documentation in benefit transfer literature could be referenced as an area of further work for monetary accounts. This could be further detailed in the future NCAVES Guidelines.

9.69 “The use of a unit value transfer approach may be limited because there are differences between the value from the observed location and the target location concerning:”

Comment: rewrite these examples to illustrate “value generalization” rather than the standard description of benefit transfer between a study and policy site as below.

-The socio-economic and demographic characteristics of the relevant populations. This might include income, educational attainment and age.

• The physical characteristics of the two sites. This might include the ecosystem services that the location provides such as, in the case of a river, opportunities for recreation in general and angling in particular.
Comment: value generalization concerns/benefit transfer one or a sample of primary valuation sites to an accounting area.
• The "market" conditions applying to the locations. For example, variation in the availability of substitutes in the case of recreational locations such as rivers. Two otherwise identical rivers might be characterised by different levels of alternative recreational opportunities. Other things being equal (by assumption in this case), the value of preventing a lowering of water quality at a river where there are few substitutes should be greater than the value of avoiding the same quality loss at a river where there is an abundance of substitutes. The reason for this is that the former is a scarcer recreational location than the latter.
Comment: the value generalization/benefit transfer challenge involves mapping substitutes and complements for all ecosystem assets at all locations in the accounting area.
• Changes in valuations over time, for example relating to increasing incomes and/or decreasing availability of clean rivers.

Comment: changes in exchange values over time is recognized here because it is a research issue in benefit transfer literature. The issue should be recognized as an issue of general importance early in ch8.

9.70
"Meta-studies (such as (OECD, 2014)) indicate that adjusting for income per capita is a significant factor in being able to apply values from one location to others."

Comment: this is a significant factor in adjusting values between countries. The SEEA EA guidance should take a position on whether ecosystem service values from outside the national accounting area are accounting compatible. To use an analogy, is it admissible to use property market price statistics from neighbouring countries, adjusted for household income, to generate hedonic pricing functions used to determine home rental values for the national accounts? They would appear to be compatible as a "tier one" method in some instances in national accounts (e.g. pricing of computers) but should be replaced by domestic data.

9.71 "A more sophisticated form of value transfer is to undertake a value function transfer. In this approach to value generalization, rather than transfer the single estimate of value adjusted only for income, a value function transfer takes the function estimated from a primary research study in one context and applies it in another context taking into account a wider variety of factors that influence the unit value. A value function may encompass factors such as the physical features of the location, changes in population age structure between the two sites and differences in population density."

Comment: It would be useful to recognize the importance of GIS and spatial econometrics for spatial value generalization using a spatially explicit value function, and to recognize the need for spatially explicit primary valuation studies being available for generalization. This should be identified as a knowledge gap that needs further work – fundamental for realizing monetary ecosystem accounts.

9.72 "A more comprehensive way to carry out value transfers is to use meta-analysis (e.g., more comprehensive way to carry out value transfers is to use meta-analysis (e.g., (Bateman et al., 2000)), which takes all existing studies and then estimates a relationship that gives changes in the values of ecosystem services as a function of, inter alia, site characteristics, attributes and size of population affected, and the type of statistical method used in the analysis of existing studies. This is then transferred to the new application in a procedure referred to as meta-regression-value-transfer, which gives a range of values to the new application depending on the characteristics embedded in the meta-regression. This approach is well suited to developing estimates for additional sites but may need to be supported with other techniques in order to provide estimates at larger scales, including at the national level. "

Comment: Most meta-regression-value-transfer borrows statistical power from observations outside the country of application. As commented previously, the SEEA EA guidance may need to take a position on whether ecosystem service values from outside the national accounting area are accounting compatible. See comment above.

9.73 "In terms of accuracy, research Kaul et al. (2013) suggests that value transfers are most effective when there is a degree of geographical proximity between the observed and target locations, when there is a focus on valuation of quantities rather than qualities of ecosystem services provided, and results can be improved by pooling estimates. Accuracy should also be considered in the light of the measurement objective wherein the type of decision-making context will influence the requirements. For example, if data are required for site level cost assessments it may be that value transfer itself is inappropriate and direct observation is required. "

Comment: The example of accuracy requirements for value generalization/benefit transfer should use examples relevant to the primary purposes of ecosystem accounting, e.g. trend detection in ecosystem asset value.

Comment: A more complete and recent benefit transfer reference that discussed accuracy is Johnston, Robert J., Kevin J. Boyle, Maria Loureiro, Ståle Navrud, and John Rolfe. "Targeted Guidelines to Enhance the Validity and Credibility of Environmental Benefit Transfers." Submitted as Part of the Thematic Session, "Benefit Transfer for Natural Capital Accounting," Proposed for the 25th EAERE Annual Conference, Berlin, Germany., January 28, 2020. This could be further detailed in the future NCAVES Guidelines.

9.74 “Fundamentally, the quality of value transfer approaches will be influenced by the number of observed valuation studies.”

Comment: More specifically that primary valuation studies are spatially explicit, making them appropriate for spatial generalization.

“In developing these studies co-ordination with the requirement for organizing data on ecosystem extent, condition and ecosystem service flows in physical terms is highly recommended since this information will assist in consistently differentiating and classifying locations and in ensuring appreciation of the supply and use context for the ecosystem services. “

Comment: The importance of GIS-based spatially explicit physical and monetary valuation models could be highlighted here.

9.75 “A final general comment that concerns value transfer but also all aspects of valuation of ecosystem services is the need for documentation of methods and the recognition and assessment of levels of uncertainty. The conceptual ideal of location-based pricing of individual ecosystem services is clear but this will likely be possible in only a few instances due to resource constraints, in much the same way as socio-economic statistics are commonly based on sampling techniques, for example of household expenditures and consumer prices. Clear documentation of the data sources, and the methods and assumptions applied in forming aggregate values for entry into the accounts will support informed interpretation and use of the accounting estimates.”

Comment: as made clear in previous comments, uncertainty documentation should not be a final comment, but an initial comment directly related to the different purposes of ecosystem accounting. Support can be found in e.g. Figure 2 and Table 1 in the MAIA contribution to the NCAVES valuation guidelines.

Norwegian Environment Agency emphasizes the following general and specific comments to **Chapters 8-10**.
Chapters 8-10 deal with the monetary valuation of ecosystem accounting, outlining the principles and valuation methods of ecosystem services and assets. All chapters are clearly organized with a defined purpose and solutions. Something that is missing is maybe a discussion on how far the research on valuation methods has come, what's left to research and specific strengths and weaknesses.

As always, reading a textbook of an area of research and understanding the underlying principles does not mean that it is easy to do in practice. They therefore suspect that after

managing the first three accounts in the ecosystem accounting system, compiling them into monetary terms may pose its own challenges.

Chapter 8

General comments:

Chapter 8 outlines the core principles of monetary valuation used in ecosystem accounting in applying the national accounting concepts of valuation. Practitioners of monetary valuation of ecosystem accounting need therefore to have a solid knowledge of the SNA system beyond what is described in chapter 8.

Most ecosystem services and ecosystem assets are not traded directly on markets, requiring the application of non-market valuation techniques. The usage of these valuation techniques may be well established practices in various branches of the Norwegian public sector, but they suspect that many will need time to research various databases of valuation studies before applying these methods. Apart from this, the chapter establishes a solid foundation on the assumptions taken for the valuation principles of ecosystem services and assets.

Specific comments:

8: It might be relevant to include a discussion on what values that are not covered by using this method in the introductory part of the chapter.

8.29: This section describes ecosystem services that are inputs to both the production of goods and services, and therefore embodied within the values of goods (SNA) and services (SEEA EA). More discussion around this issue may be helpful.

Chapter 9

Chapter 9 describes how to value the ecosystem services flow account in monetary terms by outlining a range of techniques for valuing transactions. A useful addition to the chapter would be an example similar to annex 10.1 in chapter 10. It would then be easier to follow the overall argument of the chapter and by that interpreting the different transaction techniques. A discussion of how to handle risk and uncertainty of the different valuation techniques might also be a useful addition.

Chapter 10

General comments

Chapter 10 sets out the structure of the ecosystem monetary asset account and associated accounting entries. The organization of the chapter and the discussion around changes in the monetary value of ecosystem assets are good. As of today, changes in the state of Norwegian ecosystems might realistically be done at the main ecosystem level for most ecosystems. This depends on the previous work on the other accounts, and the initial process of creating account 10 therefore depends on how this turns out.

Specific comments:

10.3.5: A more comprehensive discussion around asset lives may be useful.

10.3.7: If different countries choose different discount rates in the NPV calculations of ecosystem assets, how does this affect a possible future comparison between countries?

Annex 10.1 provides an informative example of the net present value method.

Question 6. Do you have comments on Chapters 12-14 of the draft SEEA Ecosystem Accounting?

Norwegian Institute for Nature Research (NINA) on Chapter 13.3. Biodiversity:

Norwegian Institute for Nature Research (NINA) suggests that in Chapter 13 the Nature Index for Norway is presented as a ' thematic biodiversity accounts'.

Norway has over 14 years developed the Nature Index (NI) (www.naturindeks.no) to estimate the state and trends of biodiversity in Norway. NI consists of 260 indicators distributed across the ocean, coastal waters, freshwaters, forests, semi-natural ecosystems, wetlands and mountains. The index is presented for five regions within Norway but allows for flexibility in reporting units if necessary. The reference condition concept is identical to that for assessing ecosystem condition, based on the concept of 'intact nature'. The NI focuses on population abundances or surrogates for these.

The chapter identifies that species distribution may be used as indicators. In Norway several models of species distributions have been developed in different projects. However, distribution does not identify impacts of human pressures, and such indicators may not reflect assets of species. In addition, it is difficult to choose what species to present in the thematic index for biodiversity. Different species have different environmental requirements, and thus the choice of indicators showing species distribution may not be relevant for accounting.

Indicators of ecosystem extent and condition may be derived from the previous chapters, while overuse of some species may be derived from data within the Nature Index.

NINA would also like to give a comment on species diversity, or richness. Norway has low diversity due to its climatic zone. Climate change and the introduction of alien species may actually increase diversity, although that is not the kind of biodiversity increase one would like to see. The SEEA EA should include a section discussing what to include in diversity accounts before release. Another issue is that it is difficult to measure diversity without spending a lot of resources on species-level monitoring.

Norwegian Institute for Nature Research (NINA) on Chapter 13.4 Accounting for climate change:

Today, the Norwegian greenhouse gas accounts have some shortcomings:

- lack of knowledge about carbon storage in Norwegian ecosystems
- lack of Norwegian data for use in models and long time series
- uncertainty in the data material and little data outside forests
- the accounts are based on rough estimates for calculating soil carbon

Management practices are important for the ability to absorb and store carbon in ecosystems. The effect of management practices on condition and thus carbon flux needs to be addressed, and also more research must be carried out on this topic. Increased knowledge of condition of ecosystems can be used to improve models and to make more differentiated and accurate calculations for different types of areas with different management regimes.

Degradation and area changes and fragmentation cause carbon leakage and change conditions for sequestration and storage. Thematic accounts for climate should include effects om management practices.

NINA proposes the following improvements in carbon accounts:

1. Use of national data: Model input and parameterization om size of carbon stock, degradation rates for different types and sizes of litter and dead wood and estimates for humus degradation.
2. Inclusion of all processes that contribute to uptake and loss of carbon: Inclusion of carbon transfer from living trees in the soil, negative effects of forestry, positive effects of protection, restoration and longer rotation times, effects of fertilization on carbon dynamics (especially in the long term) as well as cumulative effects of several stressors on carbon dynamics (e.g. temperature increase x fertilization).
3. Measurement and monitoring of the actual carbon stocks and the changes in them and the need for improved models and model validation data.

Specific comments from Norwegian Institute for Nature Research (NINA) on:

Carbon accounts:

A 13:3 “Biocarbon includes all organic carbon in the biosphere, i.e., carbon in living biomass (plants and animals) and dead biomass (soil organic matter and sedimentary organic matter)119 Biocarbon includes biomass in crops, grass in meadows, which is thus not considered as carbon accumulated in the economy. Carbon stored in livestock, however, is considered as part of ‘carbon in the economy.“

Comment 1: Peat is extracted as fuel and as substrate for greenhouse plant production (vegetables and ornamentals).

Comment 2: Soil organic carbon can be degraded (lost to the atmosphere). The level of SOC, is an indicator in many cases of soil condition. Also, new studies start bringing in the biological composition of soils as an indicator of soil condition.

A 13:5. “Furthermore, it is recommended to separately record on at the highest-level carbon in agricultural systems, to allow the distinction between carbon uptake and release between natural and semi natural ecosystems and agricultural ecosystems”.

Comment 3: This finer distinction should also apply to forestry ecosystems.

A 13:6.
Comment 4: Then, to develop indicators of soil condition is crucial in accounting.

A 13:10.
Comment 5: It is very important that ALL carbon stocks (natural and managed) - in living plant biomass (all), in other biomass (e.g. soil and other organisms), dead material and the more permanent soil organic compounds - are accounted (as would be produced in a life-cycle assessment).

A 13:11
Comment 6: When forestry practices cause carbon emissions from the soil (through e.g. soil disturbances & soil preparation), or peatland (through drainage) the carbon emissions to the atmosphere or losses of organic carbon particles from the soil (e.g. are transported by water bodies to the ocean) should be accounted in the economy. They are not at the moment (in contrast to what happens in agriculture). These are not accounted fully at the moment in the LULUC reporting under the Kyoto Protocol.

A 13:12.
Comment 7: Stock accounts sound a good solution. Then ALL processes leading to flows of stocks should be taken into account, including the flow from the soil to the atmosphere and/or to the ocean and fresh water sediments in ecosystems with and without human intervention.

A 13:14.
Comment 8: These should include contractions caused by forestry practices and operations beyond timber or other than biomass extraction, e.g. caused by modification of soil (increased levels of SOC mineralization and soil erosion).

Species accounts
13:48. “
Prioritize use of land for restoration of biological carbon stocks through reforestation, afforestation, revegetation, restoration and improved land management, taking account of differing trade-offs in respect of food, fibre and wood production”

Comment 9: “… trade-offs in respect of BIODIVERSITY, food, fibre and wood production”. Since the climate actions under LULUCF often encompass land-use / land-management practices, and which have been the major direct driver of biodiversity loss, extreme care needs to be put into designing climate mitigation actions, so that they are synergistic

and do not trade-off with biodiversity. Otherwise, the solutions will solve (short-term) climate challenges at the expense of biodiversity.

GHG emissions accounts
13:55.
Comment 10: Emissions from soil due to agriculture and all other land-use practices that affect soils (e.g. forestry, peatland extraction and drainage (include this in agriculture and forestry).

Comment from **Statistics Norway** on
13.57 (The GHG emissions):
This point should be clarified further and discussed in relation to **Chapter 6**, point 6.93. Will the calculations of emissions, and sequestration, be based on SEEA, or by taking into account the principles of SEEA EA, encompassing more of the nature system, important for the carbon balance, and based on LULUCF assessments, as described in **Chapter 6 point 6.93**? The capacity of ecosystems to retain carbon could also be discussed here in connection with ecosystem condition and basis for ecosystem services in **Chapters 5 and 6**.