Ecosystem accounting in decision making at multiple governmental and geographical levels

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Abstract

Implementing SEEA EA can contribute to decision making at multiple governmental and geographical levels – an entire country, a region, a municipality, or a specific nature area or development project. Ecosystem accounts on different decision levels will have differing institutional arrangements, users and needs. Yet, it is a goal that different decision levels use consistent data sources, definitions and structures to the largest possible extent.

The paper presents how ecosystem accounting (EA) is implemented at different decision levels in Norway, how work at different levels is connected, and some possibilities and challenges.

At the national level, EA will become part of official statistics in line with SEEA EA. User needs are coordinated through a reference group with relevant stakeholders including data suppliers, administrative bodies, and research institutes. EA is integrated in the Kunming- Montreal Global Biodiversity Framework, national targets, and international reporting on EA.

At the municipal and regional levels, the main goal is to use EA to measure changes in land use and ecosystems and ecosystem services over time and to make it relevant for municipal planning. To build strong cooperation between administrative bodies and public sectors will be important to address current challenges related to the loss and depletion of ecosystems and biodiversity in Norway.

At the project level, multiple initiatives aim to create EA for businesses and industries to document the impact of land use on ecosystems and their value, and to manage and plan impacts during the project development. Two major processes to develop framework for mapping and reporting processes are currently underway on renewable energy and transportation.

The Norwegian Environment Agency will provide guidance and enable access to data in order to assist municipalities, regional authorities and businesses in setting up and using EA. In this work the Agency will investigate how EA can be integrated with existing tools and measures for spatial planning and how EA can be integrated with EIAs (Environmental Impact Assessments) in order to better map project impacts.

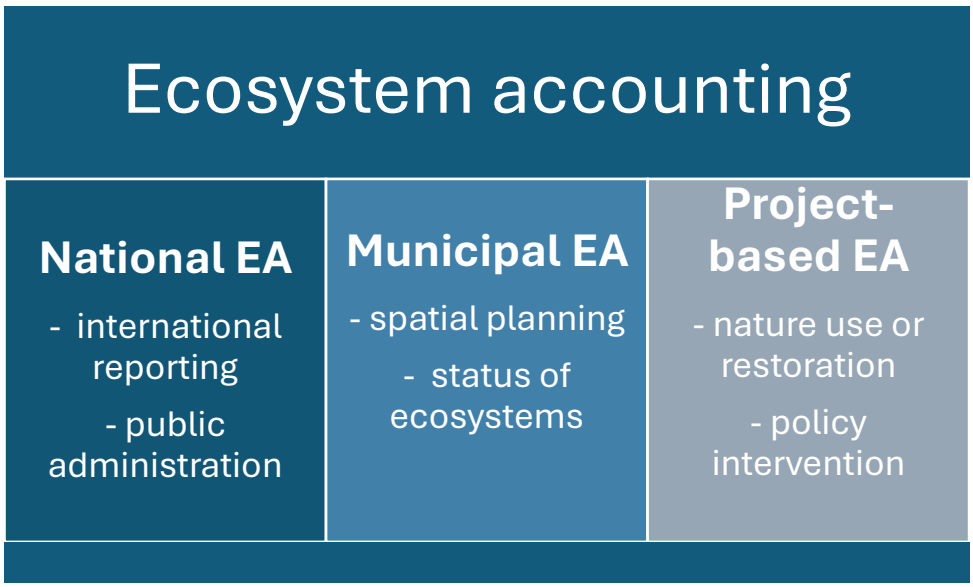
Content

1. Ecosystem accounting in Norway

Ecosystem accounting in Norway is being implemented across multiple levels of governance and geographic scales. Ecosystem accounts on different decision levels will have differing institutional arrangements, users and needs. It is, however, a goal that different decision levels use consistent data sources, definitions and structures to the largest possible extent. This paper presents how ecosystem accounting (EA) (UN et al, 2021) is implemented at different decision levels in Norway, how decision structures are connected, and some possibilities and challenges.

The three primary governance levels are national, municipal/regional, and project based. Figure 1.1 illustrates the three levels and their main uses.

Figure 1.1 Levels of ecosystem accounts in Norway



The three levels of ecosystem accounting in Norway are characterized by distinct user needs and premises. These differences will be explored throughout this paper.[1]

The Norwegian Biodiversity Action plan (Meld. St. 35 (2023-2024)) is made to respond to the goals of the Kunming-Montreal Global Biodiversity Framework. The action plan addresses national policy needs and discusses how ecosystem accounting can be a tool to address these needs. The biodiversity action plan states that:

"*Norway has lacked a comprehensive overview of nature's values and how we affect it*" and that "*The government is now addressing this by establishing an accounting system for nature [read ecosystem accounts] … [] to obtain systematic and regularly updated knowledge about the extent and condition of the various ecosystems and about the services nature provides us*.

This will give us a more comprehensive overview than today, and a better understanding of what nature means for society and the economy. Ecosystem accounting will provide an opportunity to follow developments in nature over time and regularly assess target achievement. This will give

[1] Part of the information on ecosystem accounting from the Norwegian Environment Agency's webpage is translated and used in this paper.

national, regional and municipal authorities a better basis for decisions and choices of instruments related to nature management, land use and interventions in nature." (p. 8).

In fact, the action plan contains 89 references to ecosystem accounts and related accounts like the ocean accounts. The use of Ocean accounts is also discussed in the national management for Norwegian Ocean areas (Meld. St. 21, 2024). This shows that the ecosystem accounts will be an important data source for the national plans and targets related to biodiversity over the coming years.

An important element of national policy relevance of the ecosystem accounts is that they should be used as the basis for overviews given every four years to the Norwegian parliament on the status, goals achievement and progress in implementing the biodiversity action plan.

The Norwegian Parliament supports the Government proposal to make efforts into developing ecosystem accounts and to use them on all three governance levels as proposed in the Biodiversity Action plan.

Despite the variation in approaches, efforts are being made to ensure coherence across the different levels of ecosystem accounts wherever feasible.

At present, it is not possible to establish a single, overarching ecosystem accounting system that fully accommodates diverse user needs across governance levels and geographic scales. This is primarily due to insufficient data resolution, particularly for accounts at the municipal and project levels. This challenge is most pronounced for condition accounts and ecosystem services accounts, whereas for extent accounts it will likely be possible to use one common data source.

Another complicating factor is that some user needs are tied to specific analytical tools that extend beyond the scope of ecosystem accounting itself—for example, tools designed to assess multiple impacts of land-use changes.

2. Ecosystem accounting at national level

The UN framework for Ecosystem Accounts (SEEA EA) has been developed and implemented through a collaboration between the UN Statistical Division, national statistical offices and other international bodies (UN et al., 2021). The UN framework, which was adopted in 2021, establishes that national statistical offices shall have a central role in the management and development of national ecosystem accounts, ref. 1.6.2 of the SEEA EA. This shall contribute to the development and publication of ecosystem accounts in line with the UN framework. This requires the use of recognised statistical methods and principles to ensure the reliability, credibility and independence of the ecosystem accounts. An active role for national statistical offices is essential for ensuring effective coordination between ecosystem accounts, environmental accounts, economic accounts, and other national statistics. At the same time, the UN framework for ecosystem accounting emphasizes that national ecosystem accounts must be developed in close collaboration with environmental management authorities and relevant data suppliers and research institutions. This collaborative approach has been adopted in Norway, particularly through the close partnership between Statistics Norway and the Norwegian Environment Agency in the development of ecosystem accounts. These two

institutions have distinct roles and responsibilities in the process, which will be further outlined as follows:

- Statistics Norway (SSB) is the central authority for the development, preparation, and dissemination of official statistics in Norway. Statistics Norway is the responsible authority for following up on Norwegian commitments on ecosystem accounting under the revised EU regulation on environmental economic accounting and for related reporting to the European statistical office, Eurostat. Statistics Norway is the Norwegian contact point for the work in the UN on the development of environmental accounting in general and with environmental accounting according to the UN system (SEEA EA) in particular.

- The Norwegian Environment Agency (NEA) has the overall responsibility for all the ecological aspects of the ecosystem accounts. The Norwegian Environment Agency has as a goal to maintain good dialogue with other relevant stakeholders, such as municipalities and counties, especially those who have their own initiatives for land use and ecosystem accounting.

2.1. Development of national ecosystem accounts

The development of national ecosystem accounts in Norway is coordinated by Statistics Norway and the Norwegian Environment Agency, following a formal cooperation agreement made in 2023. The development of ecosystem accounts is included in the current National Programme for Official Statistics (2024–2027), which outlines a phased approach: beginning with extent accounts, followed by condition accounts, and then ecosystem services accounts (Statistics Norway, 2024).

There are three cornerstones in the development of ecosystem accounts in Norway; the UN framework for ecosystem accounting, the upcoming reporting to Eurostat and the task commissioned by the Norwegian Ministry of Climate and Environment to the Norwegian Environment Agency to ensure that "*an ecosystem account that is useful for policy and management purposes in line with international standards and obligations is established at the national level from 2026 and is updated regularly*" (Tildelingsbrev Miljødirektoratet, 2025, English “Annual letter of Assignment to the Norwegian Environment Agency, 2025”).

The first major milestone in developing national EAs is the reporting to Eurostat and their integration into national statistics starting from 2026. Subsequent work will focus on expanding the accounts to meet information needs at national, regional, and local levels, with the aim of supporting policy development and land-use management across spatial scales.

The progress in developing national ecosystem accounts is highly dependent on a broad collaboration among stakeholders, data providers, and public authorities. This work requires both capacity building and the establishment of institutional partnerships. Accordingly, strong interdisciplinary communication is emphasized to ensure coordinated efforts in the national development of ecosystem accounting.

2.2. User needs

The national ecosystem accounting framework in Norway is expected to go beyond the reporting requirements of Eurostat, aiming also to meet domestic needs for data on nature and ecosystems to better support decision-making and nature management.

An important element is that the government wants to "establish and regularly update ecosystem accounts and a set of instruments which will contribute to maintaining biodiversity of ecosystems in a good ecological condition" (Meld. St. 35 (2023–2024), p.62). This underpins the implementation of ecosystem accounting.

To ensure the policy-relevance of ecosystem accounts, it is crucial to identify and incorporate a broad range of user needs throughout the account development process. To facilitate input from important users and data providers, Statistics Norway has established an advisory group, called reference group for national EAs. The group is organized according to the same principles as those of regular advisory committees for other areas of official statistics. The topics for which the group will advise are stated below and are adopted from the mandate of other existing committees. The reference group is intended to meet four times per year, with each meeting focusing on selected themes identified at the beginning of the year. Reference-group participants are also encouraged to propose additional relevant themes for discussion.

The reference group shall advise Statistics Norway on the following topics:

- Identify and justify user needs,
- Provide input on the use of relevant data sources, tools, models, etc.,
- Prioritizations within statistical work,
- Advise on how the results should or could be communicated
- Provide input on further development work for the coming year (short and long term).

The members of the reference group consist of relevant administrative bodies like ministries and national agencies, research institutes, and data providers. Additional organisations may be invited into the group dependent on the topics on the agenda for the meetings. Many of them are important partners in the development of ecosystem accounts. The reference group facilitates the possibility for research and governmental institutions, including the Sámi Parliament of Norway, to discuss the work on ecosystem accounting in Norway.

In addition to the reference group, user needs are also mapped through already established channels of communication for example in inter-agency groups and thematic working groups working within specific subjects related to ecosystem accounting.

2.3. International reporting and follow-up

Statistics Norway and the Norwegian Environment Agency are preparing for the first mandatory reporting to Eurostat as part of the new legal obligation under the EU-regulation on environmental economic accounting which was adopted in December 2024. This will serve as the basis for the national ecosystem accounts and is seen as the minimum requirement for Norway's national ecosystem accounts.

Statistics Norway is a member of the task force on ecosystem accounting working on the implementation of the EU-regulation. Relevant experts in Norway are contributing with their expertise and experience within different topics.

Norway is also preparing for the upcoming reporting of goals and indicators under the Kunming-Montreal Global Biodiversity Framework, looking at how the data from the national ecosystem accounting can contribute as a data source for the reporting. A broad consultation is currently being conducted to include all relevant stakeholders and data providers in the future reporting.

These different reporting requirements highlight the importance of ecosystem accounting both at national and international level for the monitoring of the state of nature and ecosystems.

3. Ecosystem accounting at municipal and regional level

The work on municipal and regional level has two entry points, on one side the Norwegian Environment Agency is tasked by the Ministry of Climate and Environment to advise and assist municipalities in their development of municipal ecosystem accounts. On the other hand, the Ministry of Local Government and Regional Development recommends municipalities to prepare land use budgets and accounts for improved spatial planning.

3.1. Differences and similarities with the national ecosystem accounts

The most important difference between the national and the municipal ecosystem accounts is that the national accounts must follow international accounting standards and principles and will serve as the basis for reporting on both international and national level, whereas the ecosystem accounts at municipal level are not mandated to follow the same formal requirements.

Currently, it is not possible to follow international accounting standards (specifically, SEEA EA) for the accounts at municipal level, due to lack of enough detail in the data.

The accounts on municipal level must therefore use alternative methods and data sources. However, the national ecosystem accounts can contain the same data used at the municipal level if the data fulfills the national requirements. For the extent accounts, the data source can be used for both national and municipal level. This is the Norwegian Base Map that is being developed in cooperation between the Norwegian Mapping Authority, The Norwegian Institute for Bioeconomy research, Statistics Norway and the Norwegian Environment Agency. The Base Map is built on existing data from the public mapping database (DOK), which shows land cover and land use data (Strand et al., 2024). In addition, ecosystem information has been included according to Eurostat's classification system of ecosystem typology (Aune-Lundberg et al., 2025)

The main data sources that will be used for the national ecosystem extent accounts are characterized by a level of detail that enables their use in both the national and municipal ecosystem accounts. The same data will therefore be used. For condition accounts and ecosystem services accounts, the level of detail is insufficient to be used at the municipal level.

The Norwegian Environment Agency will provide municipalities with datasets on various nature themes that can and should be included in a municipal ecosystem account. However, the Norwegian Environment Agency will not produce the accounts for the municipalities. Instead, it will give recommendations on which data is essential and facilitate its use. It is therefore up to the municipalities to decide whether they want to produce their own accounts.

3.2. The connection to municipal spatial planning

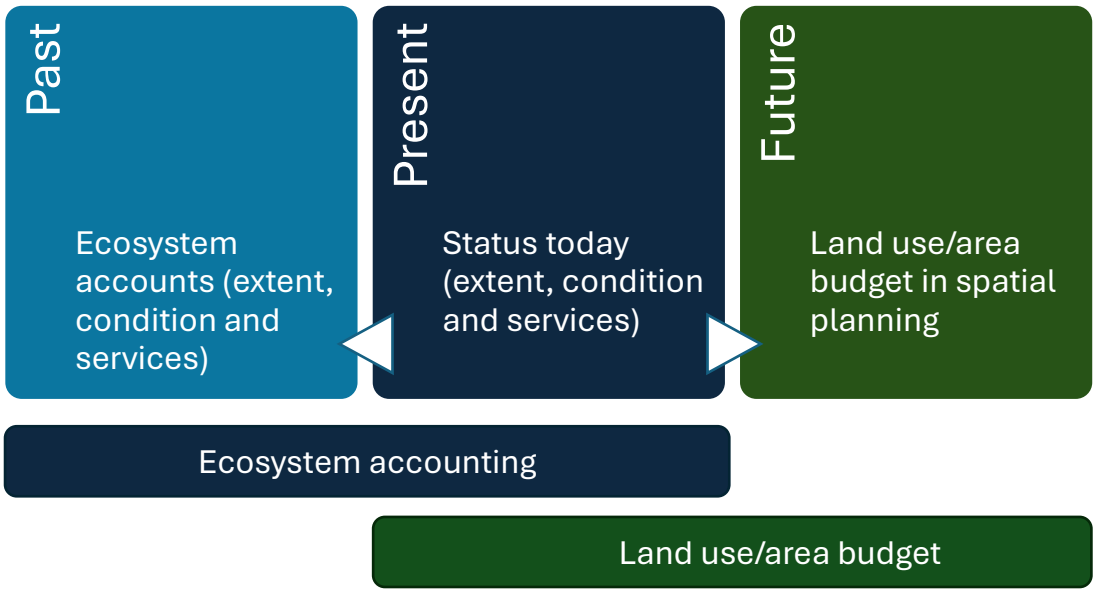
The Ministry of Local Government and Regional Development recommends that municipalities prepare land inventory accounts as part of the municipal planning process to give more information for decisions regarding special planning. The land inventory accounts resemble land use accounting and are used to keep track of existing development areas and land reserves/land needs.

Several municipalities as well as most of the county administrations have already started to develop their own land use budgets. A great cooperative effort is currently being undertaken to make these types of accounts as useful and detailed as possible. A main facilitator for this cooperation is a large R&D project by the Norwegian Association of Local and Regional Authorities (KS) helping municipalities prepare for the development of both land use budgets/accounts and ecosystem accounts. Several municipalities are involved in carrying out case studies, and several relevant ministries and agencies/directorates are involved in the project.

The goal is that the land use accounts will be based on the ecosystem extent accounts as soon as the extent accounts have been developed, to improve the information on nature in municipal and county accounts.

Figure 3.1 illustrates the connection between the ecosystem accounts and the land use accounts. As the main purpose of the land use accounts is planning, the connection to the ecosystem accounts is in the Present, where the status is given by the latest update of the ecosystem accounts. The Past - presented by time series in the ecosystem account - are useful to show trends and previous effects of, for example, land use changes.

Figure 3.1 Illustration of the connection between ecosystem accounts and land use accounts[2]



The counties play an important role in assisting municipalities by organizing seminars and providing the development of tools, technical solutions and guidance for improved spatial planning. This also ensures that the same methods are being used across municipalities. Going forward, counties are expected to play an important role in the future development of municipal ecosystem accounts.

4. Ecosystem accounting at project level

Project based ecosystem accounts are inventories that describe how specific development projects may affect—or have affected—the natural environment within the development area. By examining the types of habitats and species present in an area slated for development, one may assess how they are likely to be impacted by the project. This provides an overview of the anticipated impacts of the project on nature. If the assessment is repeated after the development, and in cases where some restoration measures have been implemented, it will be possible to create an account on the actual impact the project has had on the natural environment.

The NEA is responsible for providing guidance and facilitating the use of project based ecosystem accounts. The primary target group for these accounts includes enterprises and infrastructure/project developers planning major projects that affect nature, as well as consultancies undertaking environmental assessments for such development projects.

Data on project impacts is typically collected in impact assessments. In Norway, formal impact assessments (KUs) are legally required for plans or projects that may have significant effects on the environment or society (FOR-2017-06-21-854, Regulation on Impact Assessments §8, 2017).

The Norwegian Environment Agency (NEA) has evaluated both the regulatory framework and the practical implementation of impact assessments through a series of commissioned studies

[2] Source: https://www.miljodirektoratet.no/ansvarsomrader/overvaking-arealplanlegging/arealplanlegging/kommunale-naturregnskap/

(Multiconsult, 2021; NINA, NIBR, and Holth and Winge, 2022; SALT, 2023; Menon/Ecofact, 2024). These evaluations have revealed several shortcomings: assessments are frequently incomplete; they lack sufficient fieldwork and typically fail to include the required evaluations of cumulative impacts on biodiversity and nature. Moreover, the impacts of projects on ecosystem services—such as flood protection, carbon storage, and erosion control—are rarely assessed.

The NEA has therefore proposed amendments to the impact assessment regulations (NEA 2024). NEA suggests improved review mechanisms and quality control of impact assessments. Furthermore, impact assessments must evolve to address emerging policy areas, such as potential requirements for net-zero emissions or nature-positive outcomes, the growing demand for sustainability reporting, and the need for more comprehensive mapping of both individual and cumulative project impacts.

The proposed amendments have been subject to public consultation and are currently under review by the relevant ministries. Among the proposed changes is the requirement to conduct impact assessments for the zoning components of municipal master plans. The NEA also recommends the development of land inventory accounts for individual projects and, in the longer term, the application of ecosystem accounting (EA) methodologies at the project level. To better address cumulative effects from multiple smaller projects, the NEA proposes the establishment of a national database of impact assessments.

In 2024-2025, an industry-funded initiative led by the Norwegian renewable energy sector has supported the development of a project-level EA methodology (Fornybar Norge 2025). Three consultancies collaborated to create what is referred to as the "nature points method," which draws inspiration from the UK's Biodiversity Metric (Panks et al. 2022). This method focuses on ecosystem extent, condition, and biodiversity, but does not yet incorporate ecosystem services. While the method has been developed, further refinement and testing are required. Pilot testing is currently underway in 2025.

5. Challenges and possibilities

The work on implementing ecosystem accounting in Norway is quite complex and exhaustive. A long-term goal may be to have one data hub for ecosystem accounting data that could serve all levels, where data could consistently be aggregated up from lower scale project and municipal accounts to national scale accounts.

For this to be possible it is important to make sure that one uses standardised indicators at all levels. This means that one as early as possible should make sure that the work on accounts at the project, municipal and national levels are well aligned. The starting point and the purposes for the three accounting levels are somewhat different and this must also be taken into consideration when the accounts are further developed.

Keeping standardized indicators in mind is important when addressing technical challenges. Currently, accounts at the national level do not have sufficient data granularity to be able to answer questions about project impact on ecosystem condition and their potential capacity to produce ecosystem services. And as mentioned, even municipal level accounts do not have the sufficient data on ecosystem condition and ecosystem services. Some actions are taken to improve the level of detail and granularity in national maps. An example of this is a development project that NEA is conducting in 2025, which uses remote sensing, modeling and artificial intelligence to improve data about nature, with a focus on mountains and wetland areas.

National ecosystem accounts seek to measure change over time. On the other hand, projects often perform one evaluation at the start of the project with no measurements after the project is completed. Temporal effects in both municipal and project accounts must therefore be considered in order to align with the national work. The NEA proposes that project ecosystem accounts should be made both before the project starts, and after the project is completed. This would allow the nature impacts from individual projects to be integrated into national ecosystem accounts. How this could be done in practice is yet to be explored.

A third challenge is to reconcile valuation approaches. At this point, project-level assessments (e.g., impact assessments or the "nature points method") typically focus on ecosystem extent, condition, and biodiversity. These are often biophysical or qualitative evaluations, designed to meet regulatory requirements or guide mitigation initiatives. But project evaluations should also integrate the provision of ecosystem services, such as regulating services like carbon storage or flood protection—as these are important for climate mitigation and adaptation, and nature-based recreation and tourism.

While challenges remain in terms of data, the current work helps highlight these challenges at all decision levels. The need for better data on ecosystem condition and supply and use of ecosystem services at the project level, for sustainability reporting and net zero policies may incentivize the collection of new data that also are useful at the municipal, county and national levels. It is important to focus on standardization and interoperability of data at the various decision levels where possible. For accounts to be useful at all policy levels one must make sure that the information in the accounts is communicated well, e.g. through software packages, digital twins and databases.

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