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Public policy uses of the SEEA stocks and flows accounts

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Abstract

The System of Environmental Economic Accounting Central Framework (SEEA CF) was adopted in 2012. In one decade, it has expanded to 92 countries, including most OECD countries. However, there is still work to be done by national statistics producers to increase the use of SEEA statistics. This paper focuses on the SEEA stocks and flows accounts, providing examples of where they are already used to support public policy making in high-priority areas such as climate change, environmental sustainability, the circular economy, and management of ecosystems and freshwater, as well as feeding into indicators, dashboards and other frameworks. Although these examples show that SEEA statistics are already informing public policy making in many countries, there are still important “influence gaps”. The second part of this paper discusses why these gaps exist and what can be done about them.

Résumé

Le cadre central du système de comptabilité économique et environnementale (SEEA CF) a été adopté en 2012. En une décennie, il s'est étendu à 92 pays, dont la plupart des pays de l'OCDE. Cependant, les producteurs de statistiques nationales ont encore du travail à faire pour accroître l'utilisation des statistiques SEEA. Ce document se concentre sur les comptes de stocks et de flux du SEEA, en fournissant des exemples de cas où ils sont déjà utilisés pour soutenir l'élaboration des politiques publiques dans des domaines hautement prioritaires tels que le changement climatique, la durabilité environnementale, l'économie circulaire et la gestion des écosystèmes et de l'eau douce, ainsi que pour alimenter des indicateurs, des tableaux de bord et d'autres cadres. Bien que ces exemples montrent que les statistiques SEEA éclairent déjà l'élaboration des politiques publiques dans de nombreux pays, il existe encore d'importants "déficits d'influence". La deuxième partie de ce document examine les raisons de ces lacunes et ce qui peut être fait pour les combler.

Keywords: environmental-economic accounting, evidence-based policy making, environmental policy-relevant statistics, climate change, circular economy, natural capital

JEL Classification: Q5, Q4, Q2, Q01.

Acknowledgements

We would like to thank the Environmental-Economic Accounting experts around the world who gave generously of their time to discuss ideas for this paper and share useful resources and information. In particular, we are grateful to the experts who participated in interviews in 2022 as part of the research for this paper. They are (in alphabetical order): Alessandra Alfieri, Chief of the United Nations Statistics Division (UNSD) Environmental-Economic Accounts Section; Kenneth J. Bagstad, Research Economist with the United States Geological Survey at the Geosciences and Environmental Change Science Center; Steve Bass, Senior Associate at the International Institute for the Environment and Development (IIED), Raúl Figueroa Díaz, Director of Satellite Accounts at the National Institute of Statistics and Geography (INEGI) of Mexico; Carl Obst, Director of the Australian Institute for the Development of Environmental-Economic Accounting (IDEEA); Greg Peterson, Assistant Chief Statistician at Statistics Canada (now retired); Sjoerd Schenau, Statistics Netherlands and the Chair of the System of Environmental-Economic Accounting Central Framework Technical Committee; François Soulard, Research Manager, Census of Environment, Statistics Canada; Peter van de Ven, independent consultant and Lead Editor of the 2008 System of National Accounts update; Michael Vardon, Associate Professor at the Fenner School of Environment and Society, Australian National University; and Jean-Louis Weber, member of the Scientific Committee of European Environment Agency (EEA).

We would like to extend our sincere thanks to Bram Groenewoud for his assistance with the research for this paper and to the following people for their helpful comments on the drafts: Michael Nagy (UN Economic Commission for Europe); Arturo de la Fuente and Stephan Moll (Eurostat); Kirsten Oleson (University of Hawai'i); Colin Webb, Norihiko Yamano, Myriam Linster, Rodrigo Pizarro, Asa Johansson and Paul Schreyer (OECD).

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Summary

The System of Environmental Economic Accounting Central Framework (SEEA CF) was adopted in 2012. In one decade, it has expanded to 92 countries, and most OECD countries produced SEEA accounts in 2022. Work to fill gaps in the production of the accounts and extend coverage to more counties is being taken forward as part of the programme of the UN Committee of Experts on Environmental-Economic Accounting (UNCEEA). The OECD is a member of the UNCEEA and leads its Area C group Developing Global Databases.

However, this paper is not as much about the data gaps as about the public policy "influence gap", and, in particular, how national statistics producers can work towards increasing public policy use of SEEA statistics. It focuses on the SEEA stocks and flows accounts, presenting examples of the evidence that they already provide to support policy making in high-priority areas such as climate change, environmental sustainability, the circular economy, and management of ecosystems and freshwater.

In addition to directly influencing decision making, the SEEA stocks and flows accounts are used in indicators and dashboards such as the United National Sustainable Development Goals (SDGs) and the OECD's *How's Life* and Green Growth Indicators. Their indirect influence is likely to increase over the next decade due to growing demand from other frameworks such as the System of National Accounts (SNA), the Convention on Biological Diversity and the new G20 Data Gaps Initiative.

Although these examples show that SEEA statistics are already informing public policy making in many countries, there are still important "influence gaps". The second part of this paper looks at why these gaps exist and what can be done about them. On the *demand side*, it describes three important challenges for producers of SEEA statistics: enhancing national statistics producers' understanding of the policy cycle; ensuring that the statistics they produce are relevant, timely and have the right level of detail; and improving communications with users. On the *supply side*, more needs to be done to expand production of the SEEA accounts, build synergies between national and international organisations, and ensure that all countries – including developing countries – have sufficient resources and infrastructure to build SEEA accounts. Where feasible, in order to realise the full benefits, statistics producers should aim to develop the SEEA as an integrated system of accounts; but this takes strong commitment, careful planning and investment, and will take time to achieve.

1 Introduction

Background

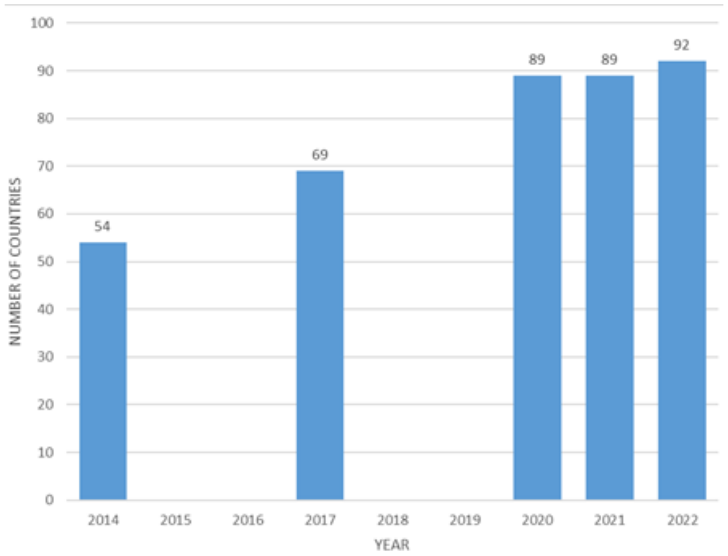
The System of Environmental Economic Accounting Central Framework (SEEA CF) is the first international standard for environmental-economic accounting. It was adopted by the United Nations Statistical Commission (UNSC) at its 43rd Session in 2012. It was the outcome of several decades of work by the UN, in partnership with other international organisations and countries around the world, to develop a conceptual framework and accounting rules for integrating environmental and economic data.[1]

One of the central objectives of the SEEA CF is to produce data consistent with the System of National Accounts (SNA), the international standard for measuring economic performance over time and other aspects of the economy such as investment, household income, wealth and employment. By making the SEEA approach consistent with the international standards for macroeconomic statistics, it is easier to monitor the impact of the economy on the environment and to understand the role played by natural capital in economic development.

Implementation of the SEEA has expanded globally as an increasing number of countries have started to produce SEEA accounts and related statistics. According to the latest Global Assessment of Environmental-Economic Accounting and Supporting Statistics (UNSC, 2023), the number of countries implementing the SEEA increased from 89 to 92 between 2021 and 2022. This is part of an upward trend since its adoption as an international standard in 2012 (Figure 1.1). In the OECD, all European Union (EU) and most non-EU countries produce SEEA accounts.

[1] To support the adoption of the SEEA CF, the *SEEA Applications and Extensions* (UN, 2012a) was also developed. This summarises the most common applications and extensions of the core tables of the SEEA CF.

Figure 1.1. Number of countries implementing the SEEA, 2014 to 2022



Source: UNSC (2023).

More still needs to be done to fill data gaps in the SEEA, i.e. to fill gaps in the production of SEEA accounts and extend coverage to more counties. This is being taken forward as part of the work programme of the UN Committee of Experts on Environmental-Economic Accounting (UNCEEA), the body that oversees the development and implementation of the SEEA. The OECD is a member of the UNCEEA and leads its Area C group on Developing Global Databases.[2] The OECD also compiles a number of SEEA accounts (see Data availability).

However, successful implementation is not just about producing statistics and addressing data gaps; it is also about ensuring that the statistics are useful (and used) for policy making and other purposes. As with many new data sources, it is taking time for data from the SEEA to feed through to where it is needed. Ruijs et al. (2019) noted that, "use of the SEEA CF in government decision making is still more an exception than the rule."

The literature review conducted for this paper showed that in the decade since the publication of the SEEA CF, there have been several studies of production of SEEA accounts, including the UNSC's annual Global Assessment; but less has been written about their use. This paper examines the question of how producers of SEEA accounts can improve the uptake of the statistics by users. In particular, how can they maximise the "public policy use" of SEEA data, a term used here to mean the application of data and statistics to help direct decision making and to influence the public debate. Therefore, this paper is not as much about the data gaps as about the public policy "influence gaps" and about what producers of SEEA accounts and related statistics can do to address them.

[2] See, for example, Area C Cover Note from the 15th UNCEEA.

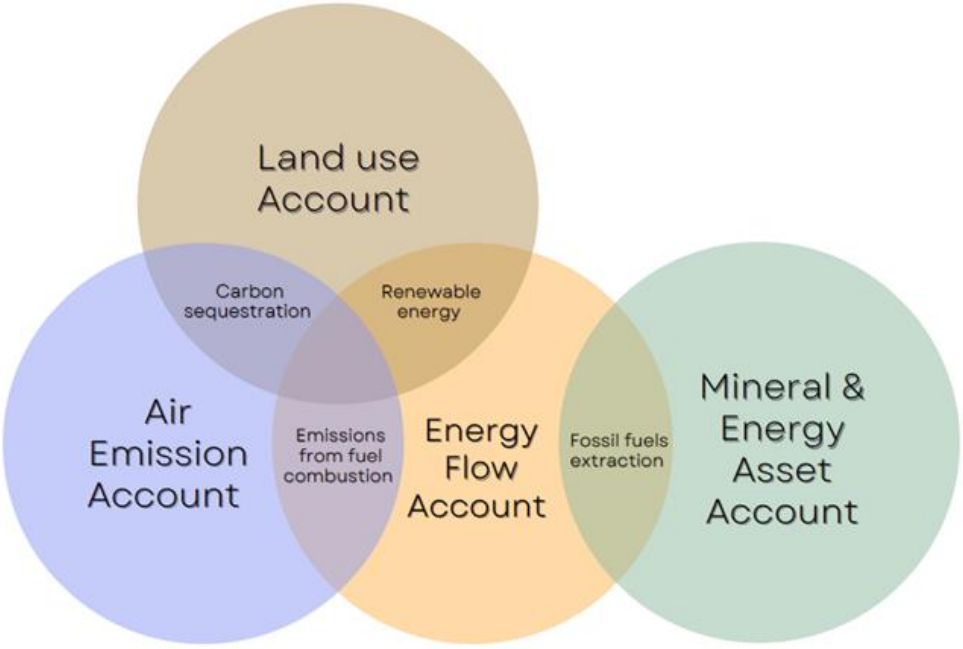
The structure of the SEEA

The SEEA CF is composed of three main components:

1. **Accounting for stocks**: physical and monetary opening and closing stocks of environmental assets (e.g. energy resources, land, water resources), and the changes in stocks in a given period.
2. **Accounting for flows**: physical supply and use of resources, aligned with changes in stocks (e.g. water abstraction by different industries, energy supply, material flows) and economies' residuals (waste and emissions).
3. **Environmental activity accounts**, recording environmental activities including the environmental goods and service sector (EGSS), environmental protection expenditure accounts (EPEA) and other environmental-related transactions like taxes, subsidies, and instruments used to reduce or offset environmental impacts.

Ultimately, the power of the SEEA – like that of the national accounts – lies in its ability to link the individual accounts into a coherent accounting framework. Figure 1.2 shows an example of how information can be integrated across the SEEA stock and flow accounts for a given policy area, such as climate change. The four topics (carbon sequestration, renewable energy, fossil fuel extraction and emissions from fuel combustion) are flow measures that are derived and balanced across multiple SEEA accounts. The existence of linkages within a harmonised system enhances the capacity to address policy needs with good information on each of the topics.

Figure 1.2. Cross-accounts data linkages for climate change



Source: The authors.

This paper acknowledges the importance of the SEEA as a system, where each component contributes to the whole. However, in carrying out the research for this paper, the main focus was on the SEEA stocks and flows accounts (Table 1.1). The environmental activity accounts, which provide information on the costs and opportunities for addressing environmental challenges, were outside of the scope of the present work.

Table 1.1. Overview of the SEEA stocks and flows accounts

Thematic area	Name of account	What the account covers	OECD countries compiling (2022)
Energy (flows)	Physical Energy Flow Accounts (PEFAs)	Flows of energy between the environment and the economy.	EU countries, Australia, Canada, Colombia, Iceland, Norway, Switzerland, Türkiye, United Kingdom
Energy (stocks)	Mineral and energy resource asset accounts	Stocks of non-renewable energy resources and minerals.	Australia, Canada, Colombia, Denmark, Italy, Mexico, Netherlands, Norway, United Kingdom, United States
Greenhouse gas emissions and air pollution (flows)	Air Emission Accounts (AEAs)	Generation of emissions of CO_2, other greenhouse gases and pollutants.	EU countries, Canada, Colombia, Iceland, Israel, Japan, Mexico, New Zealand, Norway, Switzerland, Türkiye, United Kingdom, Australia (discontinued), Korea (discontinued)
Water (flows)	Physical water flow accounts; economic accounts.	Flows of water between the environment and the economy; information on income, costs, financing.	Australia, Canada, Colombia, Costa Rica, Denmark, Germany, Ireland, Israel, Luxembourg, Mexico, Netherlands, New Zealand, Slovenia, Sweden
Water (stocks)	Physical water asset accounts.	Water cycle; water stocks and consumption/ depletion by the economy.	
Land (stocks)	Physical and monetary land asset accounts	Land use and land cover, including changes in area, use and value of land.	Australia, Colombia, Denmark, Estonia, Iceland, Italy, Mexico, Norway, Sweden
Agriculture, forestry and fisheries (flows)	Agriculture, forestry and fisheries flow accounts	Flows of agriculture, forestry, and fishery products between the environment and the economy.	Austria, Canada, Colombia, Denmark, France, Germany, Italy, Luxembourg, Mexico, New Zealand, Norway, Slovenia, Slovakia
Agriculture, forestry and fisheries (stocks)	Agriculture, forestry and fisheries asset accounts	Stocks of agriculture, forestry and fishery resources.	
Material flows	Material Flow Accounts	Material inputs and outputs of an economy (brings together other SEEA stocks and flows accounts).	EU countries, Canada, Colombia, Costa Rica, Iceland, Israel, Mexico, Norway, Switzerland, Türkiye, United Kingdom
Ecosystem Accounts	Ecosystem Extent, Condition and Services Accounts; Monetary Ecosystem Asset Account	Provides information of all aspects of a country's ecosystem in both physical and monetary terms.	Australia, Austria, Belgium, Canada, Colombia, Czech Republic, Denmark, Estonia, Germany, Hungary, Ireland, Italy, Mexico, Netherlands, Norway, Spain, United Kingdom

Note: The UN Global Assessment includes three stages of SEEA implementation (compilation, dissemination, and regular compilation and dissemination). If a country is included in the table, it does not necessarily mean that the accounts are publicly accessible or regularly updated.
Source: Authors' research and UN Global Assessment of Environmental-Economic Accounting and Supporting Statistics 2022.

The SEEA stocks and flows accounts most frequently compiled by countries in the OECD are AEAs, PEFAs and MFAs because it is a legal requirement to compile these accounts in EU countries.[3] AEAs

[3] Since 2011, EU member countries have been required by regulation 691/2011 to compile AEAs, MFAs, and environmental taxes. Since 2014, the EGSS, EPEA and PEFA accounts have been added (regulation 538/2014).

are also currently compiled by 12 non-EU OECD countries, with MFAs compiled by 10 non-EU OECD countries and PEFAs by 8 non-EU OECD countries. Other popular SEEA accounts in the OECD are ecosystem accounts (17 countries: EU and non-EU), water accounts (14 countries), agriculture, forestry and fisheries accounts (13 countries) and mineral and energy resource accounts (10 countries).

The SEEA Ecosystem Accounts

A companion guide on ecosystem accounting (the SEEA Ecosystem Accounts) was adopted by the UN Statistical Commission in 2021. The SEEA-Ecosystem Accounts expand the SEEA system for greater inclusion of spatial information, ecosystem condition measures, and flows of benefits from ecosystem services. Although this paper focuses on the SEEA CF, it also touches on some of the policy uses of the Ecosystem Accounts.

The Ecosystem Accounts focus on market and non-market benefits from ecosystems and the conditions required for ecosystems to continue delivering benefits (i.e., to remain healthy and continue supporting life). Degradation, in ecosystem accounts, is defined as the decline in these ecosystem conditions over time. Such degradation measurement complements natural resource depletion measures from the SEEA CF and the SNA. Monitoring depletion and degradation of environmental assets over time, with linkages to economic activities, is one of the main objectives for SEEA stocks (assets or wealth) accounting. Stock accounts are also connected with the flows of natural resources as well as flow of residuals back into the environment (including into oceans or the atmosphere).

Data availability

Table 1.2 shows the SEEA accounts most frequently compiled in 2022, according to the Global Assessment of Environmental-Economic Accounting and Supporting Statistics (UNSC, 2023). The picture for Europe is largely determined by the accounts that are mandatory in the EU (as discussed in relation to Table 1.1). In other parts of the world, energy and water accounts were the most popular.

The OECD provides statistical series for many of the SEEA stocks and flows accounts and related statistics on its public database, OECD.*Stat*. These include the mineral and energy asset accounts,[4] AEAs,[5] material resource flows,[6] statistics on water supply and use,[7] forest depletion and use intensity,[8] and land use[9] and land cover.[10] Data is also available from OECD.*Stat* on environmental protection expenditure.[11] The OECD Policy Instruments for the Environment (PINE) database[12] covers policy instruments that are relevant for environmental protection and natural resource management.

[4] https://stats.oecd.org/Index.aspx?DataSetCode=NAT_RES.

[5] https://doi.org/10.1787/7d88dfdd-en.

[6] https://stats.oecd.org/Index.aspx?DataSetCode=MATERIAL_RESOURCES.

[7] https://stats.oecd.org/Index.aspx?DataSetCode=WATER_USE.

[8] https://stats.oecd.org/Index.aspx?DataSetCode=FOREST.

[9] https://stats.oecd.org/Index.aspx?DataSetCode=LAND_USE.

[10] https://doi.org/10.1787/72a9e331-en.

[11] https://stats.oecd.org/Index.aspx?DataSetCode=EPEA.

[12] https://www.oecd.org/environment/indicators-modelling-outlooks/policy-instruments-for-environment-database/.

Table 1.2. SEEA CF accounts most frequently compiled in 2022

	AFRICA	ASIA	LATIN AMERICA AND THE CARIBBEAN	OCEANIA	NORTHERN AMERICA AND EUROPE
1	Energy	*Energy*	*Energy*	*Energy*	*Air emissions, Energy*
2	Water	*Water*	*Water; Agriculture, forestry and fisheries*	*Water Waste*	*Material flow, Environmental protection and management expenditure*
3	Agriculture, forestry and fisheries	*Material flows*	*Land Environmental protection and management expenditures Ecosystem extent*	*Land Oceans*	*Taxes and subsidies*
4	Land	*Air emissions Land Environmental protection and management expenditure*	*Ecosystem condition*	*Taxes and subsidies Agriculture, forestry and fisheries Ecosystem extent, Ecosystem services, Carbon*	*Environmental goods and services sector*
5	Ecosystem extent	*Waste*	*Air emissions Waste*	*N/A*	*Ecosystem extent*

Source: UNSC (2023).

Who are the users?

In order to address questions about use of SEEA accounts and related statistics, it is important to identify types of users. Previous studies, such as Rujis et al. (2019), identified three main categories:

- Public sector decision makers across government agencies responsible for natural resources, including land, and agencies responsible for cross-sectoral strategic direction, planning, budgeting, or monitoring for achievement of sustainable economic development.
- Research and analytical institutions, within and outside of government.
- Business and civil society.

This study focuses on the first category: use of evidence from SEEA in the public policy sphere. However, we also briefly refer to uses of the SEEA by the private sector. Studies[13] show that natural capital is relevant to most areas of public governance, with potentially interesting statistics for national ministries, central banks and lawmakers, including sub-national governments (such as provincial governments). The potential users of SEEA outputs include many of the national and sub-national institutions that are also sources of the SEEA data.

[13] For example, Maes et al. (2020), for the United Kingdom; and Schenau (2009), for the Netherlands, and Vardon et al. (2016).

The research questions

The SEEA CF is an integration tool, or a system of tools, which complements the SNA to produce standardised environmental-economic statistics. Its adoption by the UN Statistical Commission in 2012 created the first international standard for linking economic and environmental data.

Producers of official statistics use the SEEA to structure and organise data and to produce statistics and indicators for environmental-economic activities, typically compiled from many sources. To be fit for policy purposes, the accounts need to be relevant (i.e. covering the environmental areas of greatest concern, with sufficiently long time series and the necessary granularity[14]), as well as timely, consistent and accessible.

Statistics producers also have a responsibility to respond to demand of users such as policy makers, applied researchers and civil society so that they can feed in the data, metadata, statistics and indicators at the appropriate points. There are a number of examples, identified as part of the research for this paper, of SEEA statistics being used in public decision making in different countries, especially in the areas of climate change, environmental sustainability monitoring, the circular economy and management of ecosystems and freshwater. Examples of these uses, based on our research, are presented in **Section 2: Main benefits of SEEA stocks and flows accounts for public policy**. There are also some examples of use by the private sector, which are presented in **Section 3: Benefits of SEEA stocks and flows accounts for the private sector**.

Section 2 also presents some thinking about the probable increase in influence of the SEEA over the next decade through its use in other frameworks, in particular the 2025 SNA, the Convention on Biological Diversity signed in December 2022 and the third Data Gaps Initiative (DGI) launched in January 2023. These are cases where information from the SEEA is expected to feed into public policy through its usefulness in building other policy-relevant estimates and indicators.

Sections 2 and 3 demonstrate that there are several highly topical policy questions that the SEEA can help to address. However, **Section 4: State of play of the SEEA** asks whether the system is living up to its potential as envisaged by its designers and proponents, or whether it is underutilised, resulting in a gap between its potential influence and how much it is used in practice. It considers what more can be done by producers of the SEEA to increase its influence by understanding and addressing the needs of its users, as well as to improve capacity to produce and supply SEEA statistics.

Research methods

The research for this paper was based on a literature review and interviews with experts conducted between April and June 2022.[15] The research was organised in two phases. First, a review of published information, analyses and commentary on examples of SEEA implementation in relation to public policy. Second, a series of interviews with experts who have worked on SEEA implementation over the past decade to explore their insights into the issues raised in the literature. Those interviewed were mainly producers of SEEA statistics who have worked with users and were able to provide their perceptions of how information from the SEEA has been used, especially by public sector policy makers.

[14] Granularity refers to production of detailed breakdowns such as geographical breakdowns, breakdowns by industry or economic activity, and others (depending on the topic and type of data).

[15] The Acknowledgements section contains a list of the people interviewed for this paper.

2 Benefits of SEEA stocks and flows accounts for public policy

Many ecosystem services, such as clean air and pollination services from intact biodiversity are public goods.[16] As such, households and firms do not place enough value on these goods. Production and consumption are also often characterised by negative externalities[17] like pollution and greenhouse gas (GHG) emissions. This creates a wedge between the marginal social cost and the private cost, with prices that do not reflect, for instance, the climate damage of consumption. According to economic theory, if negative externalities are the result of market failures,[18] government intervention may be desirable through policies such as regulation, taxation and subsidies. It is also recognised that governments may have a role to play in ensuring the sustainable long-term management of natural capital because markets are not good at valuing natural capital over time.

The SEEA can help inform the design of public policies because it is a coherent statistical framework producing consistent and quality-assured information on the environment, including time series. This benefit is recognised by many producers of official statistics, especially with long histories of producing accounts according to the SEEA, such as the Australian Bureau of Statistics,[19] Central Bureau of Statistics Netherlands,[20] the French Institute national de la statistique et des études économiques,[21] the Office for National Statistics of the United Kingdom,[22] Statistics Canada (Smith, 2007), Statistics Norway[23] (Hass and Palm, 2012), and Statistics Sweden.[24]

According to UNDESA (2020a), the SEEA is an "information framework that can help policymakers break away from siloed policies and understand the trade-offs and complexities involved in climate change policies". Integration of data across domains creates possibilities for producing indicators with a more complete perspective of the economy and environmental sustainability. These can be used to inform different kinds of audiences (Figure 2.1).

[16] Goods that everyone has access to (without prejudice to other people's ability to use them).

[17] Costs incurred by someone as a result of someone else's economic activity.

[18] Situations when free markets do not produce an efficient outcome.

[19] https://www.abs.gov.au/statistics/detailed-methodology-information/concepts-sources-methods/australian-system-national-accounts-concepts-sources-and-methods/2020-21/chapter-23-satellite-accounts/environmental-economic-accounts/abs-integrated-environmental-economic-accounts

[20] https://www.cbs.nl/en-gb/search?q=environmental%20accounts.

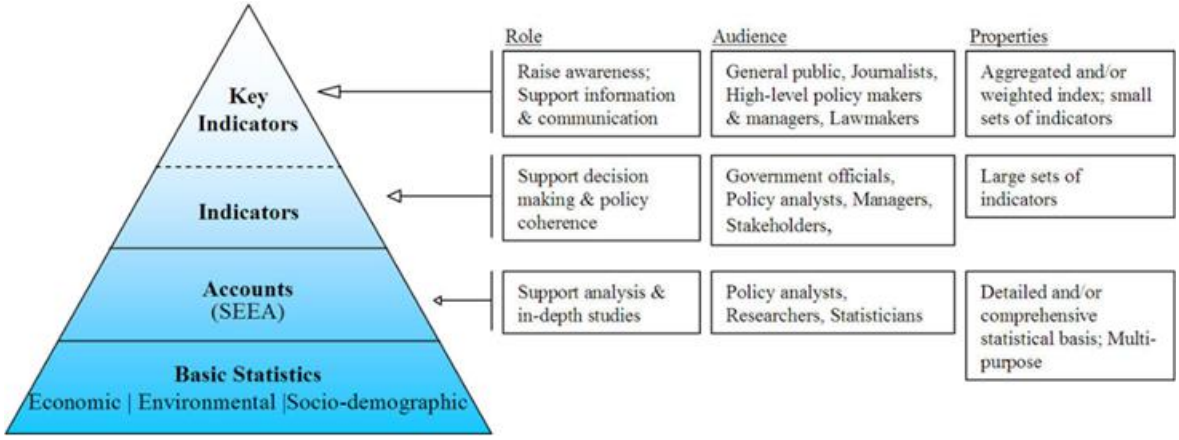
[21] https://www.insee.fr/fr/statistiques/5354778?sommaire=5354786.

[22] https://www.ons.gov.uk/economy/environmentalaccounts/bulletins/ukenvironmentalaccounts/2022.

[23] https://www.ssb.no/en/natur-og-miljo/miljoregnskap.

[24] https://unece.org/sites/default/files/2022-03/S2_3_SE%20experiences%20with%20SEEA%20implementation.pdf.

Figure 2.1. SEEA and the information pyramid



Source: UN Statistical Division: Environmental Economic Accounts Section: https://seea.un.org/.

A second benefit of the SEEA is that it has applications across many environmental-economic domains. These include management of resources (both renewable and non-renewable), waste, pollution and air quality, land, ecosystems and nature-based solutions (NBS).[25] The SEEA is being used to provide answers in areas where there are new demands for analysis such as climate change, ocean (the "blue/ocean economy"),[26] the carbon cycle, and the water (or hydrological) cycle. Alessandra Alfieri,[27] says that there are also many emerging policy areas where the SEEA could provide evidence and influence policy, such climate and nature-related disclosures and sustainable finance.

A third benefit is that the SEEA can present environmental information in money values, which is often required by economic policy makers. Raúl Figueroa Díaz[28] observes that in Mexico, policy makers demand information as monetary values. However, environmental stocks and flows are hard to value (usually requiring modelling with assumptions) and producing SEEA-based indicators in money values may require extensions or analytical applications[29] beyond those commonly used in accounting. Peter van de Ven[30] agrees that monetary valuation is a highly challenging aspect of SEEA implementation; but he argues that it is crucial to enhance its policy relevance.

[25] In 2022, the UN Environment Assembly adopted a definition for nature-based solutions as: "actions to protect, conserve, restore, sustainably use and manage natural or modified terrestrial, freshwater, coastal and marine ecosystems, which address social, economic and environmental challenges effectively and adaptively, while simultaneously providing human well-being, ecosystem services and resilience and biodiversity benefits".

[26] Recent work at the OECD on the ocean economy uses the SEEA as a foundational framework: https://www.oecd.org/ocean/topics/ocean-economy/. See also the OECD *Blueprint for improved measurement of the international ocean economy* (Jolliffe, Jolly and Stevens, 2021).

[27] Alessandra Alfieri is Chief of the United Nations Statistics Division (UNSD) Environmental-Economic Accounts Section, which serves as the Secretariat to the UNCEEA (interview, 2022).

[28] Raúl Figueroa Díaz is Director of Satellite Accounts at the National Institute of Statistics and Geography (INEGI) of Mexico (interview, 2022).

[29] Monetary valuation is discussed in Chapter 5 of the SEEA CF (2012) for natural resource stocks and in Chapters 8 to 10 in SEEA Ecosystem Accounting (2021) for flows of non-market benefits.

[30] Peter van de Ven is an independent consultant. He was formerly Head of National Accounts at the OECD and is currently Lead Editor of the 2008 SNA update (interview, 2022).

In addition to these three general benefits of the SEEA for public policy use, there are also benefits relating to specific policy areas. In the remainder of this section, we discuss some of these in more detail, focusing on the following key areas of policy interest: climate change, environmental sustainability, the circular economy, and management of ecosystems and freshwater.

Climate change

The relationships between GHG emissions and economic activities are multi-directional. Economic activities are the source of emissions, which leads to increase concentrations of GHGs in the atmosphere and radiative forces that cause global warming and are directly impacted by mitigation. Climate change is linked to most types of economic activity, and Schenau (2009) found that climate change statistical demands are associated with most economic sectors. The report of the 2020 UN SEEA Global Assessment (UNSC, 2021) identified climate change as the most frequently cited policy priority in response to SEEA questionnaires sent by the UN Statistics Division to 193 UN Member States and Territories.

A 2018 Intergovernmental Panel on Climate Change (IPCC) report stated that meeting the 1.5 degree Celsius temperature change limit under the 2015 Paris Agreement[31] would "require rapid and far-reaching transitions in energy, land, urban and infrastructure and industrial systems" (IPCC, 2018). To assess the options for such a transition, it is necessary to understand the sources of GHG emissions and the economic activities driving them. This is provided by the AEAs. The OECD's AEA database brings together official AEAs of (mainly) OECD member countries. The OECD also has a programme for estimating AEAs for countries not currently publishing official AEAs[32] and for providing additional information relating to AEAs such as CO_2 emissions from air transport (international and domestic flights).[33]

The AEAs collect data on CO_2 and other types of GHG emission and the source of these emissions (type of economic activity and households). They transform the data for alignment with the boundaries, scope and classification of economic activities used in the economic statistics, in particular the national accounts. The AEAs interact with other forms of emissions reporting, such as the inventories required by the UN Framework Convention on Climate Change (UNFCCC).

The AEAs can be used to provide policymakers with evidence on which parts of the economy are making good progress towards achieving mitigation targets and whether any parts of the economy are falling behind. For example, Figure 2.2 shows that GHG emission intensities are falling over time in a selection of OECD countries, although some of these reductions may reflect displacement of emission-producing activities to other countries. However, emission intensities vary between countries and sectors within the economies, underscoring the need to expand the coverage of official AEA compilation to cover more economies.

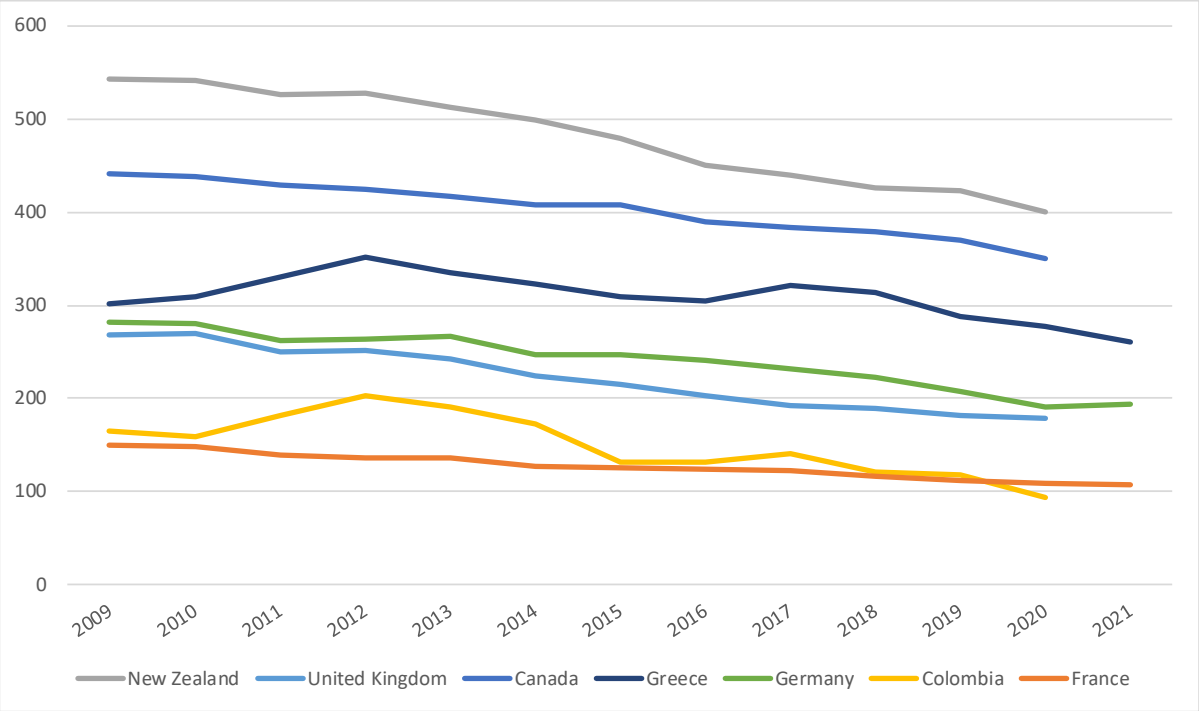
[31] https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement.

[32] For more information, see Towards global SEEA Air Emission Accounts : Description and evaluation of the OECD methodology to estimate SEEA Air Emission Accounts for CO2, CH4 and N2O in Annex-I countries to the UNFCCC | OECD Statistics Working Papers | OECD iLibrary (oecd-ilibrary.org).

[33] See CO2 Emissions from air transport : A near-real-time global database for policy analysis | OECD Statistics Working Papers | OECD iLibrary (oecd-ilibrary.org).

Figure 2.2. GHG emissions intensities for selected countries with official AEAs

Tonnes of CO_2-equivalent per unit of gross output (in millions of PPP 2015 USD)



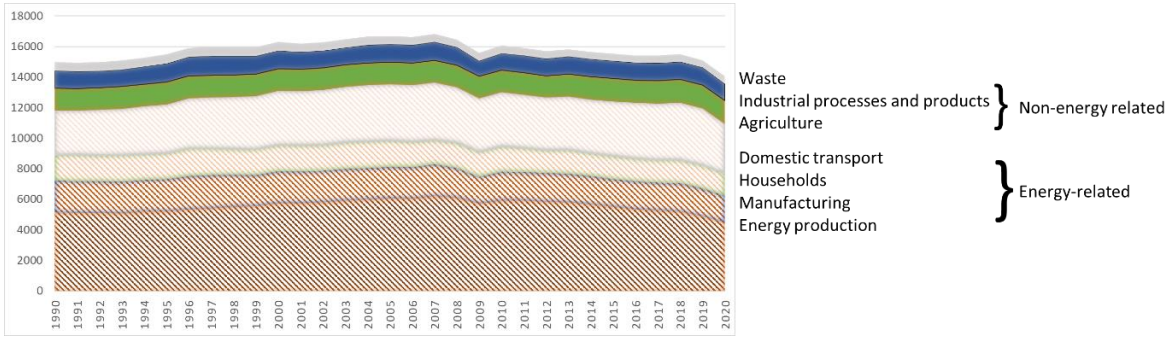
Source: OECD.stat databases: AEAs and Value added and its components by activity.

Another key area of the SEEA for users interested in climate change are the Physical Energy Flow Accounts (PEFAs), which record flows of energy between the environment and the economy; and the mineral and energy resource asset accounts, which look at energy stocks (see Table 1.1 in The structure of the SEEA). The AEAs can be linked to the PEFAs because fuel combustion, recorded in the PEFAs, is a major source of GHG emissions. Together, these two accounts can provide a robust systems approach to emissions monitoring and analysis and provide options for granular investigation of sources of emissions and energy use in an economy. In the OECD countries, energy-related emissions have accounted for around 80% of total GHG emissions for the last two decades (Figure 2.3). Combining information on emissions drivers across data sources (e.g. with energy data or with other economic data to analyse efficiencies) is a key potential function for AEAs in policy analyses.

The mineral and energy resource asset accounts are also relevant for climate change analysis, as they can be used to monitor fossil fuels (see also Sustainability). The asset accounts include the current stocks and extractions of fossil fuels (oil, natural gas, and coal).

Figure 2.3. GHG emissions from energy and non-energy sources, 1990 to 2020

Millions of tonnes of CO_2-equivalent



Note: OECD total includes estimates. This figure presents selected categories of emissions using the UNFCCC Inventories basis.
Source: OECD.stat database: GHG emissions by source, calculation by the authors.

Other policy applications of the AEAs include indicators of demand (or consumption) drivers of GHGs, including carbon footprints and emissions embodied in international trade.[34] Individual economies may be either net exporters or net importers of embodied emissions (Yamano, N. and J. Guilhoto, 2020). These indicators complement the production perspective of emissions compiled in the basic AEA format, contributing to a more complete view of the economics of climate change.[35] In 2018, average consumption-based per capita CO_2 emissions from fuel combustion in OECD countries were 3.2 times greater than in non-OECD countries (Figure 2.4). However, in OECD countries there was a fall in these emissions between 2005 and 2018, whereas non-OECD countries have seen an increase.[36]

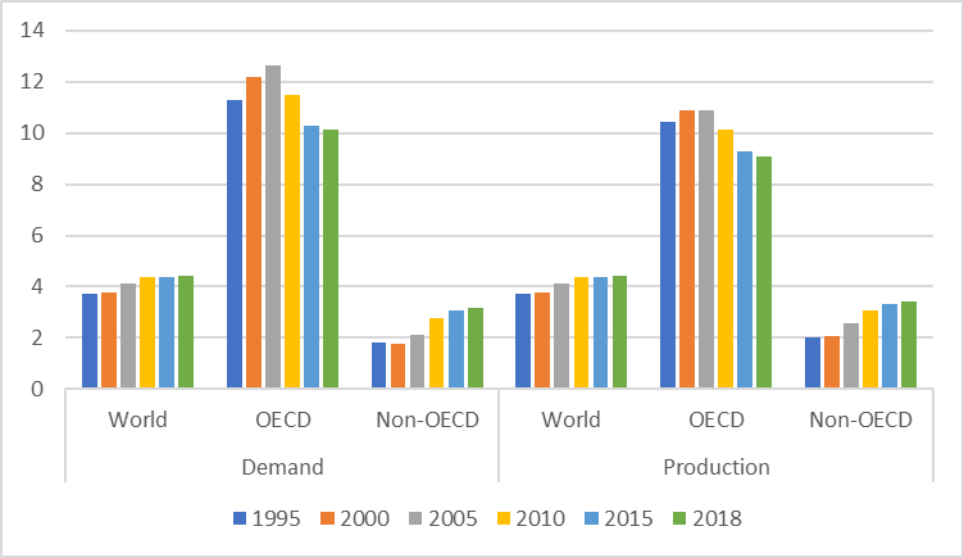
[34] https://www.oecd.org/sti/ind/carbondioxideemissionsembodiedininternationaltrade.htm.

[35] See also: Garsous, G. (2019).

[36] This may reflect both different stages of development (with less developed economies often using more polluting technologies) and relocation of polluting activities from countries with stringent environmental regulations to countries with more flexible regulatory environments.

Figure 2.4. CO_2 emissions from fossil fuel combustion: production and consumption perspectives

Tonnes per capita



Note: OECD member countries have increased over time; OECD refers to current membership.
Source: OECD.Stat database: Carbon dioxide emissions embodied in international trade (2021 ed.).

Climate change is linked with the conditions of ecosystems including freshwater resources, via links to the carbon and water (hydrological) cycles. For example, the water cycle influences forest growth, and therefore the planet's capacity for carbon sequestration. Climate also impacts desertification, a type of ecosystem degradation in arid, semi-arid, and dry sub-humid areas. A major advantage of the SEEA is the potential to establish consistency across the datasets used to monitor these inter-related environmental challenges.

Sustainability

Policy makers are increasingly interested in integrated and sustainable development models. They recognise that environmental problems like pollution and ecological degradation are inextricably linked with economic activity, and that neglecting the impact of the environment on economies will affect the future well-being of societies and people.

The development of the SEEA reflects the increased recognition that sustainable development also requires broader measures of progress. This issue has received much attention, for example through the Stiglitz-Sen-Fitoussi Commission (Stiglitz et al., 2009), the work of the OECD around measuring the progress of societies (Hall et al., 2010) which led to the OECD's *Better Life Initiative*[37] and *How's Life?* reports (see Key indicators of environmental sustainability), the greater emphasis on sustainability in the next update of the SNA in 2025 (see Policy influence via other frameworks), and the Beyond GDP[38] measurement agenda. The SEEA emerged alongside a shift of policy frameworks to a sustainable

[37] https://www.oecd.org/wise/better-life-initiative.htm.

[38] GDP stands for Gross Domestic Product.

development paradigm where economic, environmental and social challenges are understood as interdependent issues rather than separate pillars.

A well-established approach to sustainability analysis at the macroeconomic scale is via monitoring stocks of assets over time (OECD, 2011), also known as comprehensive wealth accounting. Examples from global reports include the World Bank's Changing Wealth of Nations[39] and reports commissioned by UNEP on Inclusive Wealth (Managi and Kumar, eds, 2018). The idea of comprehensive wealth accounting is to monitor all capital stocks, including human, social and natural assets and to maintain these assets – either individually or as an overall stock (see Box 2.1) – for future generations.

Monitoring changes in natural capital stocks

In this context, environmental sustainability is part of efforts to ensure the well-being of future generations by avoiding depletion of natural capital. One of the major motivations for the preparation of the SEEA asset accounts has been to account for depletion of natural capital over time (Lange, 2003). The best-known example is depletion of non-renewable mineral and energy resources, such as oil and natural gas. The OECD maintains a database[40] of available data for non-renewable mineral and energy asset accounts from the SEEA. Standardised measures for resource stocks are a crucial input for the sustainability analyses in reports on wealth produced by the World Bank, UNEP, and others. Estimates of the values for stocks of subsoil assets can be calculated using information on their planned investment and operation costs, combined with information on expected future flows of income from resource extraction industries, also known as natural resource rent.[41]

Indicators calculated from these accounts include the expected lifetime of the resource (remaining number of years under given assumptions). Figure 2.5 shows an example of lifetime analysis for Norway. The known stocks of recoverable and potentially recoverable resources at the end of each year are shown in relation to the amount extracted during the year.[42] Although for natural gas the trend is downward during the period 2006 to 2021, for crude oil there is an increase. This may be explained in part by discoveries of new (potentially recoverable) oil resources.

[39] https://www.worldbank.org/en/publication/changing-wealth-of-nations.

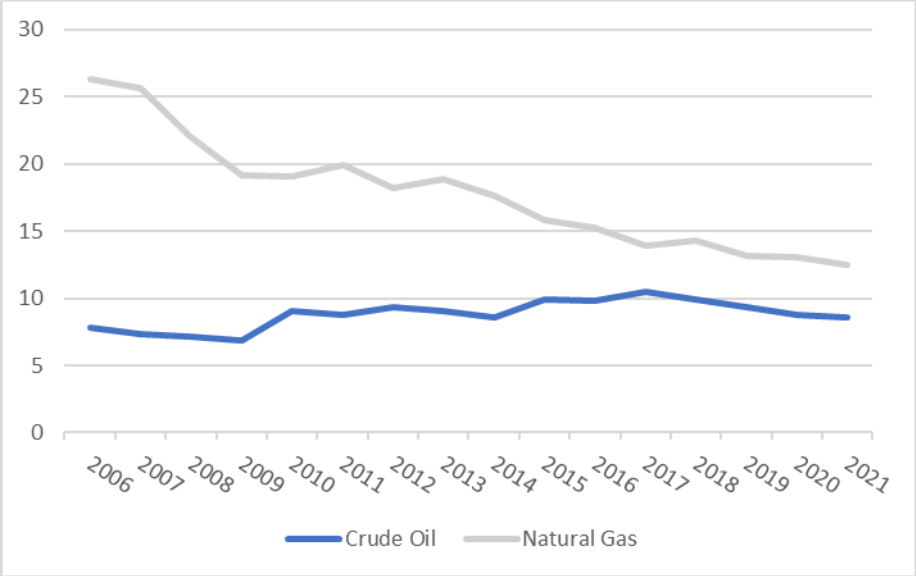
[40] https://stats.oecd.org/Index.aspx?DataSetCode=NAT_RES.

[41] https://stats.oecd.org/glossary/detail.asp?ID=2332.

[42] For more information, see Pionnier, P. and S. Yamaguchi (2018).

Figure 2.5. Mineral and energy assets lifetime analysis, Norway

Remaining lifetime (years) = closing stock relative to extraction during the year



Note: Includes only commercially recoverable and potentially recoverable resources, SEEA classes A and B.
Source: OECD.stat database Mineral and Energy Resources; calculations by the authors.

Key indicators of environmental sustainability

Indicators are an important bridge between statistics and policies. One of the most visible applications of SEEA statistics are the Sustainable Development Goals (SDGs). The SDGs framework and indicators, adopted by world leaders in 2012, builds on a movement following the first UN Conference on Sustainable Development, also known as the Earth Summit, in 1992. Monitoring for six of the fifteen main SDGs is supported by SEEA-based statistics covering land ecosystems, ocean, energy and water resources, and climate change.[43] SEEA implementation by national statistics offices (NSOs) is also mentioned in SDG *Goal 16: Peace, Justice and Strong Institutions*.

Some users are looking for adjusted indicators from the SEEA which take the initial outputs and turn them into products that are more attractive to policy makers. One example is the efforts to produce "green net measures" of production or wealth using SEEA statistics. The World Bank has produced such adjusted measures for its Changing Wealth of Nations publications.[44] This type of indicator is a useful communication tool for presenting the evidence compiled by the SEEA.

However, adjusted measures are not the only option. A study by Statistics Norway, the National Bureau of Statistics of China, and the State Environmental Protection Administration of China reviewed efforts by governments to develop "green GDP" measures. The study concluded that a single adjusted measure of value added in an economy, "while attractive as a theoretical concept, is too complex and uncertain in practice to be able to guide policy making" (Alfsen et al., 2006).

[43] https://seea.un.org/content/sustainable-development-goals, https://seea.un.org/sites/seea.un.org/files/sdg_cover_note_broadbrush.pdf.

[44] World Bank Adjusted Net Wealth Indicator: https://data.worldbank.org/indicator/NY.ADJ.SVNG.GN.ZS.

Sjoerd Schenau[45] notes that many statistics producers prefer dashboards of indicators that cover a range of themes or perspectives on integrated environmental-economic data. This is generally the preferred approach of the OECD. For example, *How's Life? 2020: Measuring Well-being* (OECD, 2020) includes natural capital as one of the four dimensions[46] of future well-being (sustainability over time), with indicators of the quality of natural capital such as protected areas and renewable energy.

Another example of this approach is the OECD Green Growth Indicators, aimed at fostering economic growth and development while ensuring that natural assets continue to provide the resources and environmental services on which our well-being relies (OECD, 2011). The Green Growth Indicators[47] provide evidence on efficient resource use and management of natural assets and their impacts on economic opportunity, well-being and policy responses.[48]

One advantage of the SEEA framework, rather than single adjusted measures, is that it produces statistics relevant to both strong and weak sustainability approaches (see Box 2.1).

Box 2.1. Strong and weak sustainability approaches

The evidence provided by the SEEA can be used for setting and monitoring targets based on either strong sustainability or weak sustainability policies. A strong sustainability approach aims to maintain current environmental capital, for example by halting all losses (via depletion or degradation) of freshwater resources or of forest cover. For instance, the SDGs call for an end (or reversal) of land degradation and biodiversity loss and for protection and restoration of water-related ecosystems. The physical measures used to assess and monitor this are direct outputs from SEEA asset (stock) accounting, for example using SEEA forest and water resource accounts as well as SEEA ecosystem accounts and measures relating to biodiversity.

Weak sustainability, on the other hand, refers to the transformation of value from one form of capital to another, which could be sustainable in the long term if the overall value of capital is not depleted over time. For example, revenue generated from non-renewable resources such as oil and gas can be re-invested to develop renewable energy production capacity.

The managers of Norway's oil fund,[49] have as their objective the long-term management of revenue from Norway's oil and gas resources with the aim of benefitting both current and future generations. The Norwegian fund is an example of "weak sustainability" in practice, as it invests revenue created from exploitation of oil and gas resources with consideration for environmental sustainability, for example by aligning its portfolio with the with global net zero emissions targets in the 2015 Paris Agreement. SEEA statistics that can be used to monitor such approaches include the mineral and energy resource asset accounts (for oil and gas reserves), AEAs data broken down by economic activity, and the environmental activity accounts (see The structure of the SEEA).

[45] Sjoerd Schenau works for Statistics Netherlands and is currently the Chair of the SEEA CF Technical Committee (interview, 2022).

[46] The other three are economic capital, human capital and social capital.

[47] https://stats.oecd.org/Index.aspx?DataSetCode=GREEN_GROWTH.

[48] https://www.oecd-ilibrary.org/environment/data/oecd-environment-statistics/green-growth-indicators-edition-2021_a16ddc34-en.

[49] Norway's oil fund is formally known as the Government Pension Fund Global. See https://www.nbim.no/.

The circular economy

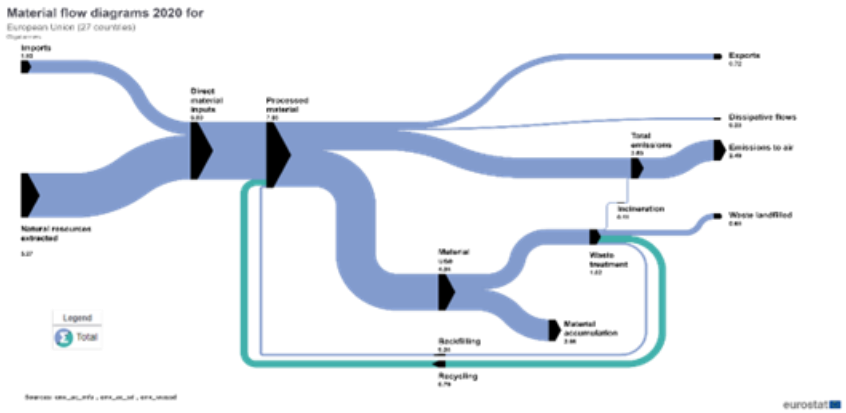
To reduce waste, which improves efficiency of the economy and minimises adverse effects to health, a society needs detailed measurement of the economy's material inputs and residual outputs. All material inputs, unless they are reused, eventually end up in the environment in the form of waste.

The SEEA Material Flow Accounts (MFAs) are designed to provide high quality statistics on reuse of materials and recycling. MFAs have existed in concept and in practice for a long time, for example from Eurostat and from the Australian Commonwealth Scientific and Industrial Research Organisation (CSIRO). They are derived from the supply and use tables in the national accounts. The supply and use framework is a way to present flows into, within, and out of an economy, organised by economic activities and balancing between supply and use information. The associated input-output tables are analytical tools built on the supply and use data that produce statistics on economic activities across sectors and across national borders.

Material flows analysis can be extended, with a few simplifying assumptions, to produce material footprint indicators of demand including imported goods and services. Since a part of demand in an economy is met from imports, which reflect goods and services produced abroad, these need to be incorporated into the calculation to complete the picture of material flows from a consumption perspective.[50]

The MFAs can also be used as a baseline measurement framework for the "circular economy", which emerged more recently as a policy concept and objective. It refers to policies that aim to minimise pollution and waste, extend product lifecycles, and enable broad sharing of physical and natural assets. The relative degree of circularity in an economy is assessed by the extent to which inputs to the economy are met by reuse, recycling, and by increased efficiency with respect to resource inputs and output of residuals such as solid waste and emissions. A Sankey diagram, such as the one in Figure 2.6, is a good way to illustrate the results from the MFAs and their relationship with the circular economy.

Figure 2.6. Material flow Sankey diagram for Europe



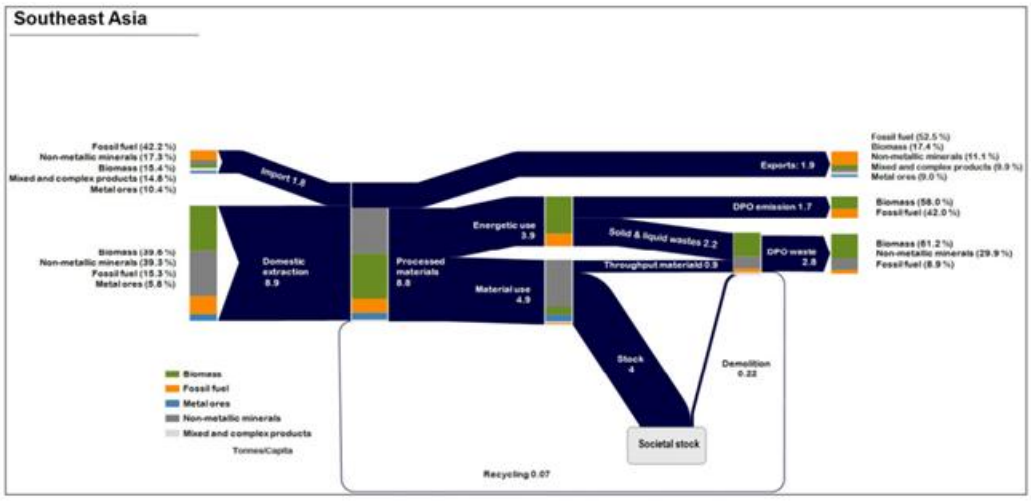
Source: Eurostat material flow diagram. Need to check reference – it does not seem to work

The production of the MFAs also makes it possible to see the details of the material mass of throughput of economies by categories of economic activity. At the macro level, such analyses are used to monitor

[50] This framework for material footprints is analogous to demand-base or carbon footprints discussed above for GHG emissions (see Climate change). For more information, see Chapter 7 in the Global Manual Economy Wide Material Flow Accounting (UNEP, 2021).

the extent to which circular economy ambitions have been achieved. For example, according to a CSIRO study (Emami et al., 2022) for the Southeast Asian economies, there is very little circularity present. Figure 2.7 shows that these economies depend on domestic extraction of large volumes of resource inputs, with relatively little recycling.

Figure 2.7. Material flow Sankey diagram for Southeast Asia



Source: Emami, N., Schandl, H., West, J. and Martinez-Marcos, R. (2022).

In February 2021, the Bureau of the Conference of European Statisticians (CES) set up a Task Force on Measuring Circular Economy. As part of this work, the United Nations Economic Commission for Europe (UNECE) and the OECD jointly developed guidelines including a conceptual framework, statistical framework and indicators for monitoring progress towards a circular economy. The UNECE-OECD guidelines, to be presented to the CES for endorsement in June 2023, note that the SEEA CF "provides the foundation for the CE measurement framework" (UNECE-OECD, 2023).

Achieving a circular economy is about making economies more resource efficient. Therefore, progress towards a circular economy underpins many other sustainable development objectives, such as reduction of GHG emissions and reducing degradation of ecosystems. For example, Government of Netherlands (2021) argues that many environmental problems are essentially the result of wasteful use of raw materials. The Netherlands has made it a goal to become completely circular by 2050.[51] This includes "a sustainable transformation of the built environment and of the adaptation of the seven million homes and one million buildings, many of which are moderately well insulated and virtually all of which are heated by natural gas, into well insulated homes and buildings that are heated using renewable heating and in which will use or even generate clean electricity" (Government of Netherlands, 2021).

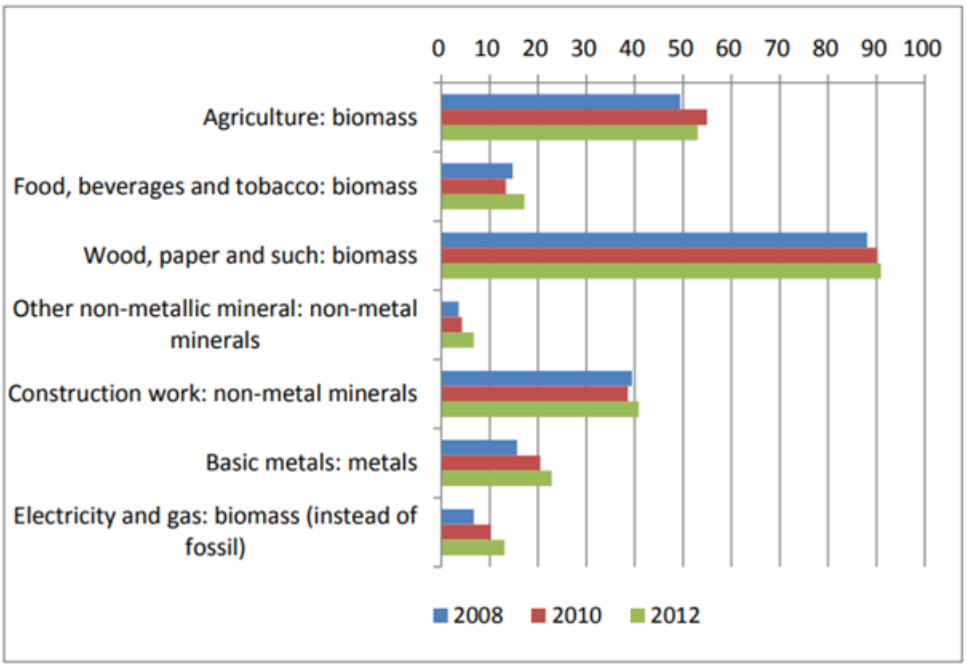
To help monitor progress towards the 2050 goal, the Central Bureau of Statistics Netherlands launched the biennial Material Flows Monitor for the Ministry of Economic Affairs and Climate Policy in 2016.[52] The documentation for the Monitor includes the technical details for measurement of material flows in the economy and provides an example of how SEEA physical supply and use accounting are used by government departments. The Monitor calculates, for example, material productivity (euro of output per

[51] https://www.government.nl/topics/circular-economy/circular-dutch-economy-by-2050#:~:text=The%20Netherlands%20aims%20to%20have,and%20raw%20materials%20are%20reused.

[52] https://www.cbs.nl/en-gb/publication/2016/05/material-flow-monitor-a-time-series.

kg of material resource input) by economic activity and the shares of secondary uses of material resources by material types (Figure 2.8).

Figure 2.8. Share of secondary uses of resources in total resources by main material type for manufacturing in the Netherlands



Source: Material Flow Monitor, Statistics Netherlands, 2015.

Ecosystems and freshwater

The SEEA accounts for ecosystems and for water catchments (river basins) can provide evidence to underpin actions by managers of these resources to reverse ecological degradation, preserve natural capital and contribute to policy analysis on topics such as risks from desertification, protection of biodiversity, and managing impacts from GHGs.

For ecosystems and freshwater, local and sub-national analysis may be as important as national analysis. According to a case study of the Netherlands in Vardon et al. (2017), "some policy measures rely on local data, whereas others require data at a higher level. A local water-quality problem usually needs a local solution, for which national-level water accounts may be of limited use to determine the appropriate policy measure". François Soulard[53] points out that spatially disaggregated datasets allow cities or regions to compare themselves, which provides insights for policies aimed at improving environmental quality.

Ecosystems

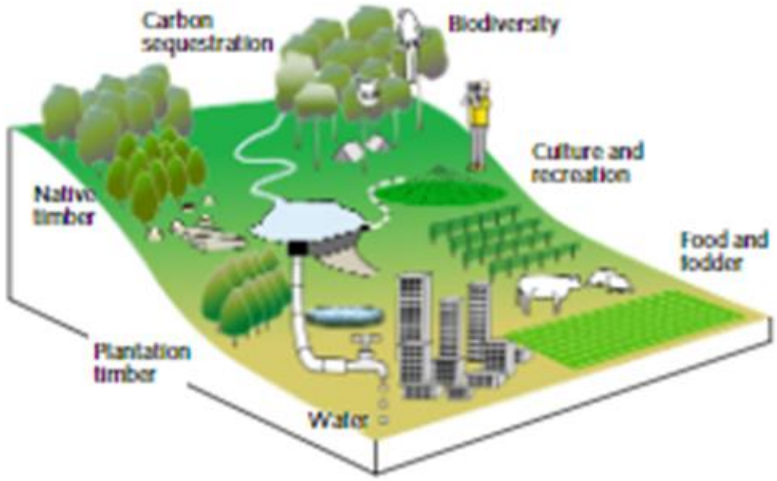
Ecosystem assessments used by decision makers incorporate a number of indicators for describing the health of the complete system (to the extent feasible), including primary production, biodiversity, and

[53] François Soulard is Chief of the Research and Development section in the Environment Accounts and Statistics Program at Statistics Canada (interview, 2022).

freshwater.[54] The SEEA Ecosystem Accounts can provide information for such assessments, bringing together multiple components of the SEEA using the common denominator of location.

Keith et al. (2017) describe a case of ecosystem accounts influencing important land management decisions for a region in Victoria, Australia. A consortium involving the Australia National University, the Ministry of Environment and the Australian Bureau of Statistics linked ecosystem assets and services with economic activities in the region (Figure 2.9). The work evaluated ecosystem services and their contribution to industries to reveal trade-offs between competing land uses. It highlighted the greater transparency of costs and benefits in the trade-off decisions as a key advantage of these accounts. After two of the study's authors presented the accounts produced to Victoria's Minister of Environment, the government of Victoria copied them for all forest management regions of Victoria[55] and a decision was made to cease native forest logging.[56] Although influence is always difficult to prove, the authors believe that the accounts were influential in this decision.[57]

Figure 2.9. Ecosystem services and land management



Source: Keith et al. (2017).

In another case study, in Guatemala, Vardon et al. (2017) identify a broad range of policy benefits for sustainable forest management from the ecosystem accounts. The study notes, for example that "the accounts revealed the extent of uncontrolled logging, which takes place outside institutional regulatory frameworks, and some of it is illegal. It also revealed households' high dependence on fuelwood."

One of the most well-documented examples of implementation of ecosystem asset accounts and their potential for policy influence, comes from a project conducted for the Guiana Shield, an area not defined by national borders but including parts of six countries: Colombia, Venezuela, Brazil, Guyana, French Guiana (France) and Suriname (see Box 2.2).

[54] Jean-Louis Weber interview, 2022.

[55] https://www.environment.vic.gov.au/__data/assets/pdf_file/0034/459574/Ecosystem-services-from-forests-in-Victoria-Assessment-of-Regional-Forest-Agreement-regions.pdf.

[56] https://www.theguardian.com/australia-news/2019/nov/07/native-forest-logging-to-be-phased-out-by-2030-as-victoria-plans-timber-transition.

[57] Michael Vardon interview (2022).

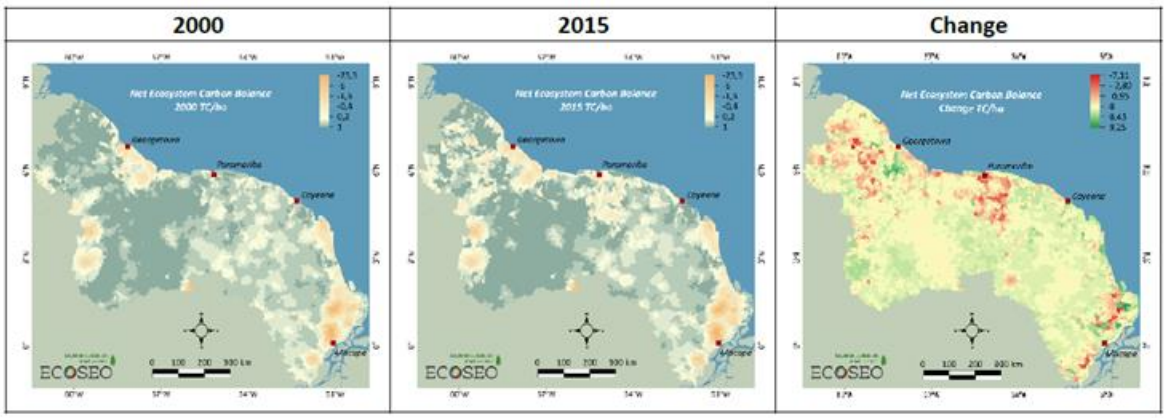
Box 2.2. Ecosystem condition accounts in the Guiana Shield

The Guiana Shield comprises 270 million hectares of valuable natural resources, including rich forest ecosystems and a subsoil that is home to reserves of gold, tungsten, coltan, aluminium and hydrocarbons. The economic demand for such valuable environmental assets creates an inherent vulnerability for natural capital. This challenging policy context spurred interest in developing ecosystem accounts cutting across national borders.

The Guiana Shield study used an indicator known as Total Ecosystem Capability (TEC) at a regional scale, which combined data across a range of sources from different countries to describe the health of vegetation and the freshwater and nutrient cycles. The TEC was designed to assess capacity for functions such as recycling of waste and carbon sequestration. It was built on three core measures: the net balance of carbon sequestration (Figure 2.10), the ecosystems net water balance, and information on the landscape, such as fragmentation. These were compiled using GIS tools and could be used to quickly identify hotspots and problematic areas, such as places where carbon sequestration was threatened. This kind of approach can be used to monitor and enforce commitments to maintain levels of natural capital for a given location, including maintenance of biodiversity, the storage of carbon in above and below ground, protection against soil erosion and fires, and the regulation of the water cycle and climate.

Figure 2.10. Assessing change in net carbon sequestration

Net ecosystem carbon flows balance, tonnes of carbon per hectare per ecosystem accounting unit



Source: Rahm M., Lardeux C., Weber JL., Ramihangihajason T. (2021).

However, achieving this is not straightforward. Statistics Canada looked at the technical challenges associated with building the infrastructure for the spatial datasets and proposed a register of assets (Whiteley et al., 2022). According to Statistics Canada (2022): “Users comfortable with analysing and manipulating geospatial data will be able to use detailed outputs from the Register of Ecosystem Assets to compile locally-relevant accounts and related statistics, or link to other geospatial data for analysis.”

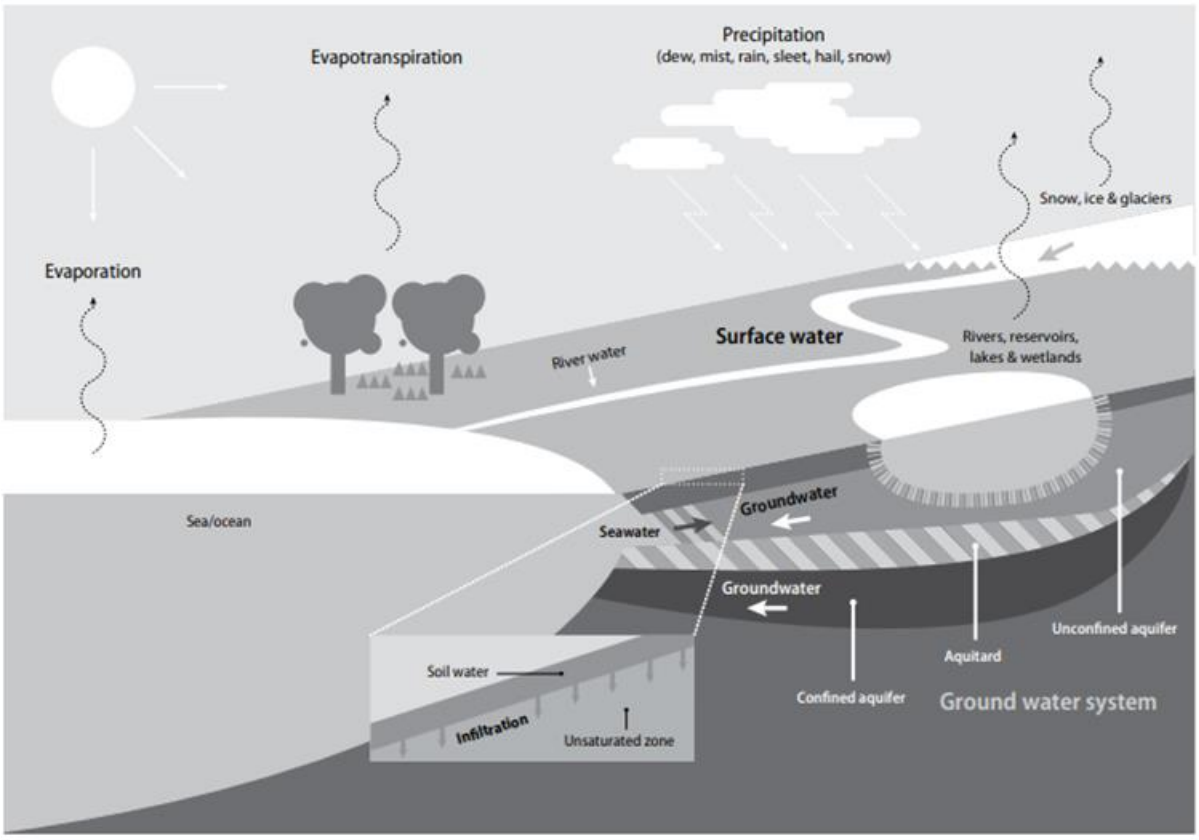
The standard accounting framework of the SEEA Ecosystem Accounts means that georeferencing functions can be reused with each update to the database over time, creating time series of spatial or geographically disaggregated data for ecosystems, including critical assets like freshwater.

Freshwater

Access to safe water is essential for human life. Freshwater is scarce and irreplaceable in many countries. It is also an issue of global importance, with links to global challenges from climate change and deforestation. Water accounts are among the most popular SEEA CF accounts for implementation, especially for developing countries.[58]

Water is a resource in constant renewal. The same water molecules have cycled for millions of years through the planet's atmosphere, land and ocean. This is known as the water cycle (technically the "hydrological cycle"), see Figure 2.11. The water cycle functions via interactions between the atmosphere and the planet's forests and vegetation. Climate change that affects this cycle may lead to a type of ecological degradation called desertification.

Figure 2.11. The hydrological cycle



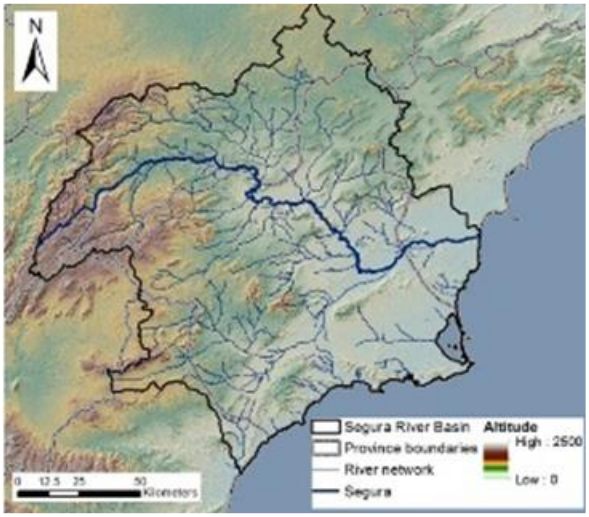
Source: UN (2012b).

[58] Alessandra Alfieri interview, 2022.

Management of aquifers and river basins is normally the responsibility of public servants in the water resources management sector. They need good information, such as that provided by the SEEA water accounts and Ecosystem Accounts, for monitoring and assessing sustainability of the available resources. The evidence provided by these accounts also has potential to reach a diverse set of users from local water management engineers to health authorities and ecosystems and climate specialists. A major challenge for those compiling the SEEA accounts is to identify and make connections with the appropriate stakeholders and potential users who need the data.

According to the latest Global Assessment of Environmental-Economic Accounting and Supporting Statistics (UNSC, 2023), in 2022 water accounts had been implemented in 32 countries. One way forward for stakeholders is to produce basic water accounts using water catchments (or river basins) as spatial units for compilation. Linked to the ecosystem accounts, these are spatially explicit compilations of information on freshwater resources and their uses in economies. The EU Water Framework Directive (WFD),[59] which is designed to protect European waters, achieve good ecological status and enable sustainable use, stipulates that water must be managed at river basin level. As a study in the Segura River Basin (Figure 2.12) in southern Spain shows, the alignment with geographic scales of policy requirements (such as those of the EU WFD) is challenging (Contreras, 2015). However, it is crucial for making the SEEA water accounts policy relevant.

Figure 2.12. Segura river basin



Source: Contreras, 2015.

In addition to spatial disaggregation, the time dimension of data can be vital for regions that have abundance of freshwater resources during the wet season and become highly arid during dry seasons. Spatial and temporal granularity of information are thus crucial for policy relevance for supply and use of freshwater resources and their relationships with the economy.

Finally, an important part of the demand for statistics from stakeholders is for qualitative indicators. For instance, the WFD calls for achievement of a “good ecological status” for all bodies of surface water and groundwater, which means moving beyond the stock and flow measures in the SEEA CF towards measurement of ecosystem condition, which is part of the SEEA Ecosystem Accounts.

[59] https://water.europa.eu/freshwater/europe-freshwater/water-framework-directive.

Policy influence via other frameworks

In addition to the specific areas of public policy interest discussed in this section, which create direct demand for SEEA statistics and related indicators, there are some areas of indirect demand for the SEEA that are likely to increase over the next decade. Key areas are the next update of the SNA in 2025, the Convention on Biological Diversity and the third DGI. The SEEA is expected to feed into public policy indirectly through these frameworks.

Governments' growing interest in environmental sustainability has led to pressure for the national accounts to provide more complete estimates of natural capital assets than they do at present. The 2025 SNA will therefore include estimates of renewable mineral and energy resources (such as wind, solar, water and geothermal power) and enhanced guidance on other assets like uncultivated biological resources. The new SNA will also provide detailed guidance on how to measure and value natural capital. The SEEA (various stocks and flows accounts) will be a key source of data for these estimates, particularly if SEEA compilers can provide them as monetary values so that they can be used directly by national accountants.

The headline measure of economic growth from the national accounts is Gross Domestic Product (GDP). However, many environmental economists argue that GDP has limitations for analysis because it does not take into account depletion of natural capital. For example, referring to the case of Colombia, Banerjee et al. (2021) note that GDP does not include forest depletion and degradation and that integrating information on stocks, flows and condition of the country's rich capital stock of forests would provide a more complete picture for economic decision-making. The 2025 SNA is expected to respond to these arguments by including depletion of natural capital in the measure known as Net Domestic Product (NDP), which complements GDP. NDP will become a measure of economic growth which incorporates the impact of production on natural capital stocks and well as on other assets such as buildings, machinery and equipment.

Another area where the indirect policy influence of the SEEA is expected to increase over the next decade is in relation to the Convention on Biological Diversity (CBD). At the fifteenth meeting of the Conference of the Parties (COP 15) in Montreal in December 2022, the participants adopted a monitoring framework to 2030, with 26 headline indicators.[60] They recommended aligning national monitoring with SEEA standards for many of these indicators. The most relevant parts of SEEA for this purpose will be land cover and land use accounting as well as statistics on environmental activities (interventions), for example those related to conservation and environmental protection. Many of the CBD indicators will depend on further development of the SEEA ecosystem accounts in the future, particularly in relation to measurement of extent and condition of ecosystems, and ecosystem services and their benefits.

Another source of increasing policy influence of the SEEA via other data frameworks relates to the IMF-led G20 Data Gaps Initiative (DGI). The third DGI, launched in January 2023, has climate change statistics as one of its four core pillars. Its work plan maps out a selection of core policy challenges for G20 countries and the urgent need for data to address them.[61] The DGI was originally established in 2009 by the G20 Finance Ministers and Central Bank Governors to close data gaps that were identified following the global financial crisis. The third DGI's climate change task team will rely heavily on the SEEA AEAs, energy accounts and related work on national carbon footprints, as well as on the SEEA environmental activity accounts for information on climate-related subsidies and expenditures.[62]

[60] https://www.post-2020indicators.org/.

[61] https://www.imf.org/-/media/Files/News/Seminars/DGI/Home/g20-dgi-3-workplan-people-planet-economy.ashx.

[62] https://unece.org/sites/default/files/2023-03/S2_6_IMF_DGI.pdf.

3 Benefits of SEEA stocks and flows accounts for the private sector

Although this paper focuses on the public policy uses of the SEEA stocks and flows accounts, it is worth taking a brief detour to explore their relevance for decision making by the private sector, which includes businesses and investors interested in sustainability of current operations or future investments.

Businesses recognise the benefits of official statistics in terms of providing high-quality, consistent and comparable data. The SEEA has the potential to provide information that businesses need on the environment for issues such as risk management, investment, supply chain management, asset and product pricing and design, cost effective compliance with regulations, due diligence for mergers and acquisitions, evaluation of a business' wider contribution to society, and corporate reporting. Kenneth Bagstad points out that the SEEA also provides more complete information for cost benefit analyses.[63]

One examples of use of the SEEA by the private sector relates to natural capital trends and trade-offs at national and sub-national scales. The SEEA can provide this in a standardised format, which may be directly relevant to investment decisions or to private research (Ingram et al., 2022).

The private sector is also interested in the circular economy and the information provided by the SEEA MFAs. Many businesses want to reuse and reduce inputs of materials, both to meet goals set by governments and to save costs. In the Netherlands, a Platform for Accelerating the Circular Economy (PACE) has been set up, comprising leaders from business, government and civil society interested in emerging technologies that can help their transition towards greater circularity.

The European Commission has posted an analysis of green investments in the circular economy,[64] which provides a collection of practical examples. These include remanufacturing (rebuilding or restoring instead of replacing equipment), investments in secondary use of materials, researching ways to reduce material inputs (for example, the Flanders' Materials Programme[65]), and brokering exchanges between industrial demand for material inputs and stocks of potential secondary uses.

Businesses have also started to make public commitments on climate change and on environmental degradation goals, for example:

- Many large global companies have committed to a transition to net-zero contribution for carbon[66] or to use of 100% renewable energy.[67]

[63] Kenneth J. Bagstad is a Research Economist with the United States Geological Survey at the Geosciences and Environmental Change Science Center. He co-leads work to develop natural capital accounts for the United States (interview, 2022).

[64] https://ec.europa.eu/environment/integration/green_semester/pdf/Circular_economy_examples_projects.pdf.

[65] https://eco.nomia.pt/contents/ficheirosinternos/vmp-eng-brochure-150ppi.pdf.

[66] https://carbon.ci/insights/companies-with-net-zero-targets/.

[67] https://www.there100.org/re100-members.

- The Capitals Coalition has released the Natural Capital Protocol to guide businesses in the measurement and valuation of natural capital.[68] The Coalition, together with the Task Force on Nature-related Financial Disclosures (TNFD),[69] involve some of the world's largest companies and investor groups.

SEEA data can be used to monitor progress towards meeting these commitments. It appears in the sustainability reports of multi-national enterprises and other large corporations. The SEEA guidance (concepts, classifications and tools) can also feed into developing "green" ratings, standards and labels and avoiding "greenwashing".

As noted in the United States National Strategy to Develop Statistics for Environmental-Economic Decisions (White House, 2023), environmental-economic accounts are also important for lending by investors and banks and borrowing by firms:

> *"A system of natural capital accounts puts nature in language that investors and banks understand. It enables banks to identify connections between natural assets and their loan books, leading to shifts in lending practices. When reliable data are not available, making such claims may expose firms to legal and reputational risk, and the inability to make such claims may limit access to financing, insurance, and market share. A Federal system of environmental-economic statistics will help de-risk (i.e., reduce the risk posed by) these claims by providing an official data source and demonstrates a systematic accounting system that firms can safely emulate or build upon."*

[68] https://naturalcapitalcoalition.org/wp-content/uploads/2019/05/Final-Data-Full-Report.pdf.

[69] https://tnfd.global/.

4 State of play of the SEEA

As the previous two sections showed, the SEEA has many potential applications for public policy and business use. However, there is a mixed record with respect to the influence of the statistics on public policy. For example, a UN Report on SEEA and Policy (UNDESA, 2020a) noted that the SEEA accounts are not always used systematically for climate change policy and there is a gap in awareness of the SEEA among policy makers. The experts interviewed for this study also noted that the applications of SEEA for policy analysis often fall short of meeting their potential.

The first reason for this "influence gap" is the novelty of the SEEA framework. It has only been in place as a statistical standard for a decade, which is a relatively short period of time in terms of how long it takes countries to develop new official statistics (particularly complex accounting frameworks) and feed them into decision making processes. There is a need for the community of producers and potential users to develop a better understanding of the relevance of these statistics at different points in the policy cycle (demand for the data), and this takes time. Producers also need to make the case for these statistics with users, communicating clearly about what they can offer. Progress on these fronts should create more demand, and they are discussed later in this section.

On the supply side, national statistical systems need to compile the accounts. This does not occur overnight – particularly for a complex system such as the SEEA, which usually involves not only countries' NSOs but also other institutions, both at national and sub-national level. In the early stages of development of SEEA accounts, national statistical systems have to make decisions about which accounts to prioritise. Such decisions may be based on factors such as their relevance to policy makers and the availability of data sources with the necessary coverage and granularity. Statistical systems can leverage benefits from the standardisation of the SEEA, but at the same time they need to evaluate what is relevant to their own national context.

The remainder of this section looks at what factors are behind the public policy "influence gap". These factors are analysed from two angles: the demand for environmental-economic statistics (the "pull" factors) and the supply-side issues (the "push" factors). In both cases, the perspective is that of statistics producers: on the demand side, what are the challenges for producers of the SEEA in understanding and addressing the needs of users and communicating better with them? And on the supply side, what more can be done to enhance the capacity of countries to produce the desired information?

The demand side

To address the "influence gap" on the demand side, research for this paper suggests that there are three important challenges for producers of SEEA statistics:

1. Understanding the policy cycle
2. Ensuring that the statistics are relevant, timely and have the right level of detail
3. Improving communications with users

Understanding the policy cycle

Statistics producers often face changes in priorities and terminology from policy makers. As described in the report of the First Forum on Natural Capital Accounting for Better Policy Decisions (Vardon et al., 2017), policy making is multi-faceted, dynamic and often messy. However, some aspects of the relationship between statistics and policy making are predictable and common across countries. For example, there is normally a cycle to the decision-making process, which is important for producers of SEEA statistics to understand. This "policy cycle" begins with problem identification, is followed by design of a policy response and then by implementation, monitoring and review.

First, producers of the SEEA may be involved in the problem identification stage, or at least in understanding the significance of a problem. Sometimes, the detailed work to compile the accounts can also lead to insights that might help clarify the problem. Second, the SEEA may be used in identifying and prioritising solutions at the policy response stage. The SEEA can provide the environmental-economic data (broken down by economic activity) to help decide on the best response. Finally, it can be used to monitor the impact of the chosen policies. For example, the outcomes of policies to reduce emissions or reduce waste, if effective, will be reflected in the AEAs and the MFAs.

However, Michael Vardon[70] notes that it is challenging for institutions compiling the SEEA to integrate their statistics effectively into the relevant steps in the policy cycle. To maximise the influence of their statistics, producers need to develop a good understanding of the cycle and of the different types of evidence that are needed at each stage.

Relevant, timely and granular statistics

The success of efforts to increase policy use of SEEA depends on whether the statistics are perceived as relevant by users, and on whether they are made available in a way that is useful for decision making. This means SEEA statistics must be:

- Relevant to the policy issue.
- Available in a frequent and timely manner (without a long lag).
- Have a long time series, if possible.
- Granular, providing economic activity breakdowns in a way that relates to the issue of interest and, if relevant, with spatial/geographical disaggregation.

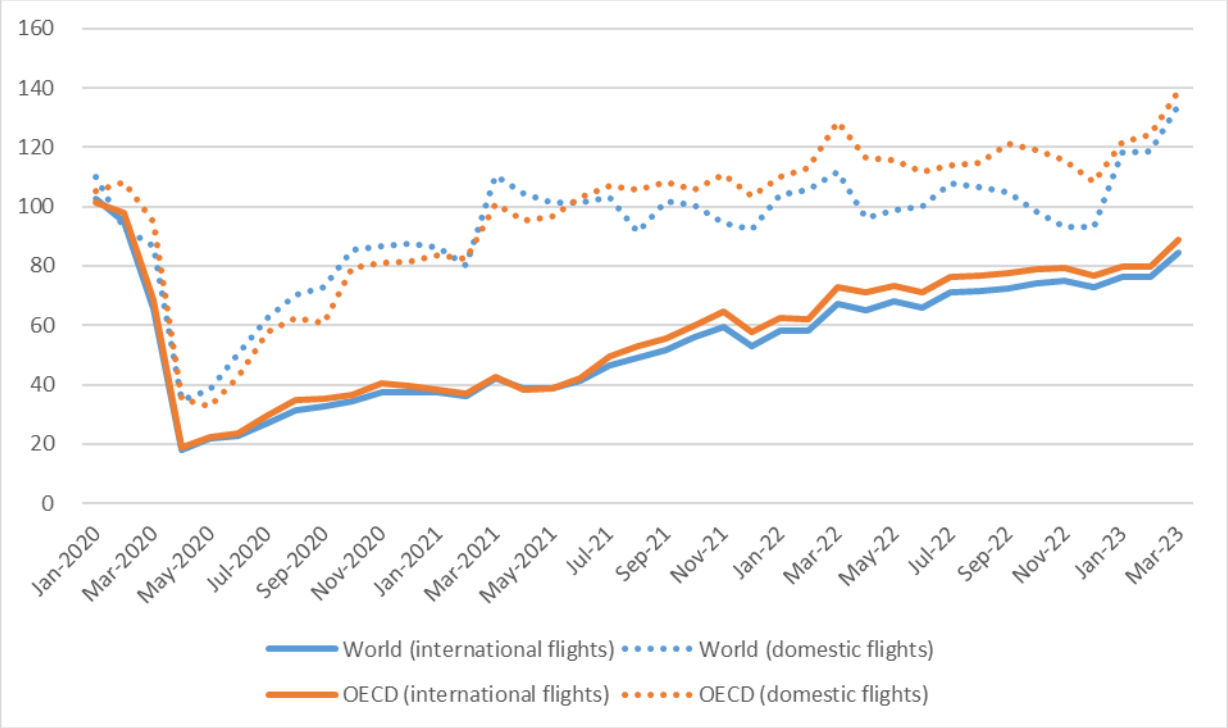
In August 2022, the White House released for public comment a draft National Strategy to Develop Statistics for Environmental-Economic Decisions. This was followed by publication of the final strategy and workplan in January 2023 (United States Government, 2023). As a justification for proposing the new strategy, it stressed the relevance of the proposed statistics, identifying a list of their main policy uses. It also emphasised the many complex ways that nature underpins supply chains, innovation and infrastructure across the economy. The strategy document noted that, "the current absence of these important economic metrics and the omission of nature from the national balance sheet leads to erosion of current and future economic opportunities."

The COVID-19 pandemic highlighted the need for more frequent and timely economic statistics as restrictions on certain activities changed during the crisis, and policy makers needed to understand their impact. Air transport, for example, after experiencing steady long-term growth for decades, was hit by the COVID-19 restrictions in early 2020. Figure 4.1 shows the impact of the pandemic on CO_2 emissions from international and domestic flights on a month-by-month basis. It shows that

[70] Michael Vardon is Associate Professor at the Fenner School of Environment and Society, Australian National University; and formerly worked at the Australian Bureau of Statistics (interview, 2022).

emissions from domestic flights have recovered pre-pandemic levels, while emissions from international flights remain lower. These estimates were produced by the OECD as part of its work on the AEAs.

Figure 4.1. CO_2 emissions relative to the same month of 2019, January 2020 to December 2022

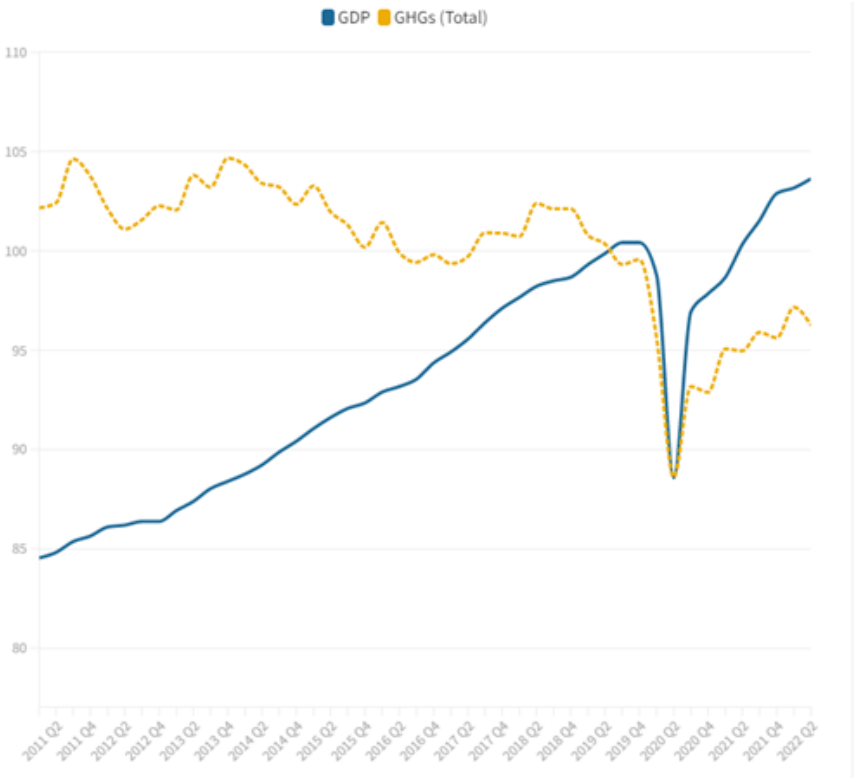


Source: OECD database on Air Transport CO2 emissions, authors' calculations.

In 2022, the OECD, Eurostat and the IMF produced quarterly GHG estimates based on the AEAs as part of efforts to provide more timely information for policy makers. The OECD estimates, published in December 2022, extend GHG emissions estimates up to six quarters beyond the latest annual data point so that they are published soon after the latest quarter of estimates of GDP (Figure 4.2). They enable tracking of the relationship between GHG emissions and GDP, which is important because *decoupling* economic growth from growth in emissions is a key policy goal in the context of countries' efforts to meet Net Zero emissions targets. The new quarterly AEAs for the OECD, show that GHG emissions fell during the period of GDP growth between 2011 to 2019. The COVID-19 pandemic led to a fall in both GDP and GHG emissions, and afterwards GHG emissions rose less rapidly than GDP. Detailed analyses of this kind of trend could reveal important insights for climate and economic policies in the future.

Figure 4.2. GDP and GHG emissions in the OECD, Q2 2011 to Q2 2022

Quarter on quarter growth (2019 = 100)



Notes: 1. GHG emissions estimates are extrapolated beyond the latest annual data point (2020), while for GDP, the estimates are "actuals" from the OECD Quarterly National Accounts database, downloaded on 6 December 2022.
2. The two series are shown as fixed base indices, with base year set on 2019, to account for differences in scale. The series meet the annual constraint (i.e., sum of quarters equals annual).
Source: OECD statistics blog: Tracking greenhouse gas emissions to support the green transition.

Economic policy makers not only require information that is up to date. They also need long, consistent time series. This is one of the major reasons for success of the national accounts based on the SNA, which have existed in the same basic conceptual form since 1953 (Vardon et al., 2018). It is a challenge for the SEEA, as the Central Framework has only been in place since 2012 and the approach to compiling Ecosystem Accounts was agreed in 2021. However, efforts are being made to build historical series where possible.

Some policies also require granular data. For example, not only the overall trends of CO_2 emissions but also information about the main drivers (and thus how reductions may be achieved). For example, for the UN's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), which is designed to help mitigate emissions from air travel, different types of flights are subject to different rules. It is possible to provide estimates for specific types of flight by tracing back from the statistics produced for AEAs shown in Figure 4.1. For other accounts also, it is often possible provide more detailed breakdowns to meet specific demands of policy makers while maintaining the overall consistency and structure of the standardised statistics.

Improving communications with users

Better communication of results was mentioned in all the interviews with experts carried out for this paper as a crucial element for reducing the "influence gap". Most national statistical offices and environmental ministries have become familiar with the SEEA in the decade since its publication in 2012. A particular challenge for the future is to reach a broader audience of users, including those involved in economic policy making, such as central banks and finance ministries, as well as people working in regional and local governments.

Peter van de Ven argues that accounting results from the SEEA can be used as the system's own promotional tool: producers of SEEA accounts should not just speak about the importance of SEEA accounts, but also demonstrate it.[71] The importance of the statistics can be demonstrated by producing sample analyses that can be further developed by analysts in government. According to Vardon et al. (2016), often just a small extra effort to create awareness is sufficient to create demand for data by users who may have had little or no previous knowledge of the SEEA. There is a potential "virtuous cycle" of support for SEEA implementation and enhance uptake of the results for policy wherever there are direct applications or communications with users.

Box 4.1. Demonstrating the uses of water accounts in Hawaii

In a presentation to the National Ecosystem Services Partnership (NESP) in the United States, Kirsten Oleson of the University of Hawaii,[72] demonstrated how explaining outputs from water accounts to stakeholders led to the identification of a number of uses for the accounts across the policy cycle for Hawaii's management of scarce freshwater resources. The accounts supported the identification of problems, which focused on the need for more efficient use of Hawaii's scarce freshwater resources. They also suggested some immediate solutions in treatment and reuse of water and a tool for monitoring new policies moving forward. The key to identifying uses for these accounts for Hawaii was the outreach and communication with resource management authorities who otherwise were unaware of their existence.

Communication of statistics requires proactive engagement on behalf of the producers of the statistics to seek alignment with the needs of policy managers. Oleson's work showed that a conversation around the results in the accounts can also help to identify scale or granularity requirements of the data. The compilation of accounts can usually be adapted following these discussions. For Hawaii, as water management is at the island scale, there is a natural unit or scale about which to communicate. For groundwater, information can also be presented at the level of the aquifer as different aquifer sources on each island have different qualities.

[71] Peter van de Ven interview (2022).

[72] Kenneth J. Bagstad interview (2022) and https://www.youtube.com/watch?v=uhXvVGrlsMM.

Box 4.2. Building a picture of users – the Canadian Census of Environment

Another example comes from Statistics Canada, which recently established the *Census of Environment: A Roadmap to Environmental and Economic Stability*. According to Statistics Canada,[73] "The overarching objective of the Census of Environment is to deliver a full picture of the complex relationship between ecosystems and the economy, society, and human health in one easily accessible location."

Experts from Statistics Canada identified many potential users for these statistics in local governments. The statistics will assist in developing policies and legislation that support healthy ecosystems and preserve natural capital, as well as informing planning by cities and municipalities. For example, the SEEA Ecosystem Condition Account allows comparison of the evolution of greenness across Canada, supporting local urban planning in the context of pressures associated with land use change, urban sprawl and climate change.[74]

To improve communications with users, some challenges need to be addressed. The first is to tailor the results from the SEEA to different audiences. Some users (in particular analysts) are interested in comparing the technical details between similar types of statistics; while others (such as high-level ministry officials) focus on the latest figures and their interpretation in the form of headline indicators and short briefings. Also, users' priorities may change, so SEEA producers need to be aware of the policy discussions and new developments. According to Greg Peterson,[75] officials working on the SEEA at Statistics Canada are expected to regularly build expertise on the relevant policy questions. Ideally, they should coordinate with users in government (for example through working groups) to keep updated on current demands. He notes that is important not to underestimate the potential complexity in policy demands, and statisticians need to be flexible about meeting specific and emerging needs.

The second challenge is that producers of SEEA statistics may have over-abundance of information. Too much data can be paralysing unless the institutions are able to identify key policy questions or opportunities and work systematically to gather and communicate relevant data. Statistics producers could improve their communications approaches by identifying key messages and producing indicators and dashboards to engage with users.

Finally, many aspects of SEEA accounting are difficult to explain to users in non-technical language. Carl Obst[76] notes that it is important to communicate to users the relevance of the SEEA not only for environmental policies but also for macroeconomic and finance policies. However, economic policy analysis depends heavily on estimates being available in money values. Converting physical estimates into money values involves accounting models and economic theory, which are complex and difficult to explain. If different assumptions are used in different valuation models, the results may not be comparable. Such complexities may be present in other statistical domains, but they are particularly prevalent for SEEA statistics, presenting a particular communications challenge.

[73] https://www.statcan.gc.ca/en/subjects-start/environment/census.

[74] François Soulard interview (2022).

[75] Greg Peterson is retired. At the time of the interview in 2022, he was Assistant Chief Statistician at Statistics Canada (interview, 2022).

[76] Carl Obst is an international consultant and Director of the Australian Institute for the Development of Environmental-Economic Accounting (IDEEA). He was the editor of the SEEA CF (2012) and is currently a member of the editorial team for the update of the 2008 SNA (interview, 2022).

The supply side

Commitment of national and international compiler institutions

To address the "influence gap" on the supply side, it is important to extend coverage of SEEA statistics, particularly to countries that have not yet embraced them. As countries' understanding of the role that the environment plays in economic well-being and sustainability develops, production of SEEA accounts should move up the list of priorities for producers of national statistics.

The international organisations also play a role. First, they provide learning opportunities such as the annual Joint UNECE-OECD Seminar on Implementation of the SEEA.[77] Second, they actively promote compilation of the accounts via the work of the UN Committee of Experts on Environmental-Economic Accounting (UNCEEA). The UNCEEA Bureau Area C, which includes the UN, OECD, IMF, World Bank and Eurostat, is charged with developing global databases. In 2022, Area C finalised data collection templates for the AEAs and the PEFAs, and from the start of 2023 these have been made available on the OECD data collection and methods website (EEA section).

Finally, each of the international organisations has a programme of work to develop new data sources and methods, such as the OECD's work on estimates for emissions from air travel and on quarterly AEAs (discussed in the previous section); and the work by the UN on the ARIES[78] for SEEA platform. These international datasets can be used by countries to help build SEEA accounts, producing efficiency gains for national compilers and help to enhance their accounts' international comparability and coherence.

The EU, in particular, has done a lot for SEEA implementation across its member states' national statistical systems. It has established regulations for environmental-economic accounts reporting,[79] providing a legal framework for a harmonised collection of comparable data from all EU Member States and EFTA countries (Eurostat, 2022). A centralised approach has paid off in terms of measurement consistency and the scope of the accounts. There are also regular discussions among experts and stakeholders within the European statistical system.

Institutional infrastructure and strategy

Institutional arrangements for producing official statistics like the SEEA accounts are different in each country, ranging from highly centralised systems to those where the work is shared between many different agencies or levels of government. In the case of the SEEA, there are strong links to the production of the national accounts. Relationships with data providers are also vital and the accounts require data from many different administrative data sources and surveys.

Independence is a vital principle for official statistics, but it is also important that there are strong personal relationships and frequent communication between government agencies. Institutional cooperation and continuous communication were repeatedly raised during our interviews with experts. For example, Greg Peterson[80] stressed the importance of statisticians and accountants regularly attending coordination meetings of other government agencies, particularly via workshops between NSOs, economic planning and environmental policy authorities to discuss and provide updates on

[77] The 8th joint seminar took place in Geneva in March 2023: https://seea.un.org/events/8h-joint-oecdunece-seminar-implementation-seea.

[78] ARIES = Artificial Intelligence for Environment & Sustainability.

[79] EU regulations 691/2011 and 538/2014.

[80] Greg Peterson interview, 2022.

demand for statistics. Fortunately, as pointed out by Carl Obst,[81] an advantage of SEEA for communication is it promotes a common language for speaking about relationships between the economy and environment.

To promote multi-agency coordination mechanisms for environmental-economic accounts, several countries including India, Italy and the United Kingdom have established high-level committees or task forces to support development of the SEEA (see, for example, UNSC, 2021). Task forces can provide a crucial mechanism for regular communication between the institutions and individuals involved in matching the "push" and "pull" for providing evidence for policy making. It is also important to include representatives of sub-national government entities in such task forces.

Many of the case studies on the use of SEEA for policy making in Vardon et al. (2017) emphasise the role of organisational structures. For example, Botswana established accounts for minerals, energy and water through a collaboration between three ministries. Special units for natural capital accounting were established in each ministry, and the deputy permanent secretaries from each ministry served as chairs in multisectoral technical working groups to build links between the supply of statistics from the new accounts and user demand.

Such high-level support within government ("political support") is essential for the success of SEEA implementation. This must include the provision of financial resources to the compilers of the statistics. Setting up a system of accounts requires careful planning and long-term investment in collection of data and production of the accounts, which means committing significant resources. According to Michael Vardon,[82] many of the limitations to greater use of the SEEA are because producers of the data do not have sufficient resources for compilation and analysis.

Ideally, a strategic, global approach to SEEA production should be promoted. Although there were 92 countries implementing at least one of the SEEA accounts in 2022 (see Background), over half of the countries in the world have yet to begin. This is important, even for the countries that already compile accounts, because many of the issues that the SEEA helps to shed light on are global problems, such as climate change and ecological degradation. Therefore, governments and international organisations should provide support for developing countries, recognising the differing priorities (for example freshwater and ecosystem accounts are important for resource-rich countries and countries with large rural populations). Such an approach would improve the coverage of global SEEA statistics for international monitoring on issues like climate change.

Where feasible, statistics producers should aim to develop the SEEA as an integrated system of accounts because this provides the whole picture. According to UNDESA (2020a), "the main advantage of the SEEA is the possibility of developing indicators that connect different policy domains in a coherent manner." Jean-Louis Weber[83] makes a similar point: the SEEA is interesting for governments because it is not a one-off project but a systematic solution.

At present, many countries only compile a few accounts, and there may be limited integration between accounts or with other statistics. Each move towards an integrated system provides efficiency gains. For example, the AEAs are components of the output portion of MFAs, and also link to the energy accounts via fossil fuel combustion and to the forest accounts via carbon sequestration. However, building a full set of SEEA accounts takes strong commitment, careful planning and investment. For example, the United States National Strategy to Develop Statistics for Environmental-Economic Decisions (White House, 2023) has a 15-year time frame; and it recommends that, once established,

[81] Carl Obst interview, 2022.

[82] Michael Vardon interview, 2022.

[83] Jean-Louis Weber, member of the Scientific Committee of European Environment Agency (EEA) and former Special Adviser on Environmental Accounting at the EEA (interview, 2022).

the system and the associated environmental-economic statistics be embedded in the broader United States system for economic statistics.

Finally, legal frameworks are important. The EU has made some SEEA accounts compulsory to compile for its member states (see Commitment of national and international compiler institutions). In the United States, the legal basis for economic statistics was strengthened via the US Evidence Act of 2018,[84] which directs action by each statistical agency or unit to expand access to data assets. The Act also establishes a Federal Advisory Committee on Data for Evidence Building, to review, analyse, and make recommendations on how to promote the use of data for evidence building.

[84] https://www.whitehouse.gov/wp-content/uploads/2019/07/M-19-23.pdf.

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