



NATURAL CAPITAL ACCOUNTING & ENVIRONMENTAL-ECONOMIC ACCOUNTING 101

Extending National Accounting Systems to Reflect Our Dependency on Nature

National Statistical Offices have been applying the concepts, definitions, and accounting treatments within the System of National Accounting to measure the health of the economy since the 1940s. Since then, policy makers, economists and businesses have relied on this information to underpin economic and financial decisions. Indicators such as Gross Domestic Product (GDP) have been at the forefront of policy debate, and central in investment decisions.

Recently, the reliance of policy makers on measures of economic performance, like GDP, has diminished. This stems from the renewed appreciation that, in the face of existential environmental risks such as climate change, biodiversity loss and water scarcity, economies and society depend on nature to thrive. Nature is being eroded at an alarming rate and losses are having real and measurable impacts on our bottom lines and on societal wellbeing.

It is now incumbent on National Statistical Offices to extend their accounting systems to track the connections between the economy and nature. Measures of wealth, for example the stock of natural capital, are just as important as measures of growth. There is a growing need to account for the environment and Natural Capital Accounting fills this void.

What is Natural Capital Accounting?

Natural Capital Accounting (NCA) is a systematic process to measure stocks of natural resources and the flows of benefits they provide, enabling the integration of economic, environmental, and social data into a coherent framework. The accounting-generated structured information facilitates coordination across various governmental agencies, thus enabling better planning, management, and monitoring of natural resources.

The United Nations' [System of Environmental-Economic Accounts \(SEEA\)](#), internationally accepted framework for incorporating nature into national accounting systems, governs NCA efforts in the public sector. SEEA includes the [Central Framework \(CF\)](#) and [Ecosystem Accounting \(EA\)](#).

While the CF focuses primarily on the provision of nature's goods to the economy, EA expands SEEA's measurements to include regulating and cultural functions of ecosystems, other natural flows of benefits often overlooked. EA involves more comprehensive spatial identification and mapping, resulting in a more complete picture of ecosystems and the benefits they provide to various parts of an economy.



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Development of the System of Environmental-Economic Accounting

Although the idea of valuing nature in economic terms has existed for years, it has only recently become possible to integrate such information into systems that governments use to make decisions. The concept of environmental-economic accounting has been around since the 1970s. For environmentalists, these accounts were intended to demonstrate the value of benefits obtained from nature, or document harms caused to nature by economic activities. Economists, on the other hand, wanted these accounts to measure sustainable income. Much progress has occurred since then, which resulted in the development of the United Nations' System of Environmental-Economic Accounts (SEEA).

Over the past 30 years, there have been many efforts to understand the contribution of nature to the economy (e.g., from fisheries, timber, water, etc.), the impact of economic investments and activities into environment (e.g., impacts of land cover change associated with agriculture expansion), and how changing environmental conditions may impact economic productivity (e.g., economic effects of deforestation of tropical rainforest, biodiversity loss, pollution of rivers and coastal waters, climate variability, etc.).

While these efforts have been valuable, the concept of natural capital has not truly been embedded into decision making process. Lack of standardization in framing and measurement has been a key problem, often with specific, 'one issue' perspectives creating potential for confusion, or ignoring complex interactions between different aspects of the environment (e.g., forestry, carbon sequestration and species habitat conservation), or between different types of economic activities (e.g., forestry and tourism).

The System of Environmental-Economic Accounting (SEEA)

In the public sector, efforts to institutionalize and standardize the approach to measuring the relationship between the economy and the environment are the domain of the UN System of Environmental-Economic Accounting (SEEA), an internationally accepted framework to incorporate nature into national accounting systems. The System of Environmental-Economic Accounting includes the Central Framework (CF) and Ecosystem Accounting (EA) and together they track the connections between the environment and the economy (see Figure 1).

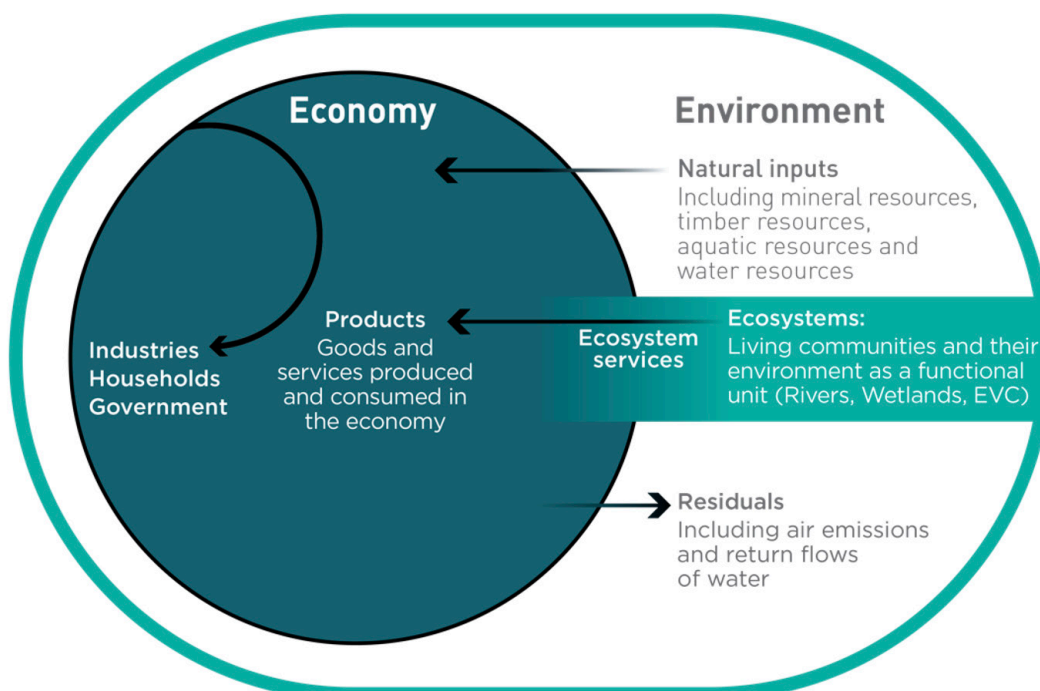


Figure 1. Physical flows of natural inputs, products, and residuals (Source: United Nations et al., 2014, Figure 2.1, p. 13).

SEEA Central Framework (SEEA CF)

The SEEA CF provide concepts, definitions, classifications, and accounting rules for integrating information about the environment and the economy. SEEA CF covers three key areas of the environment-economic connection:

1. physical flows of water, energy, emissions, etc.;
2. accounting for natural resources such as timber, fish and minerals; and
3. accounting for environmental activities and transactions by governments, businesses and households, including environmental protection expenditure and payment of environmental taxes.

The SEEA CF was adopted as statistical standard to measuring the environment and its relationship with the economy in 2014.

Physical Flow Accounting

Each physical flow account considers, as appropriate, the flows of the relevant substances from the environment to the economy (natural inputs), within the economy (flows of products) and from the economy to the environment (residuals). Accounts for water and energy track all of these types of flows. Accounts for greenhouse gas (GHG) emissions, for example, focus only on residual flows.

Physical flow accounts are the best developed of all SEEA accounts and have been implemented in many countries. Legislation in the European Union now requires countries to compile annual physical flow accounts for energy, air emissions and material flows. Direct relationships can be made between standard economic accounting measures such as output and value added, and physical measures such as water and energy use, and greenhouse gas emissions (GHG).

Accounting for Environmental Activities and Transactions

Accounting for environmental activities in transactions relates to the organization of information from standard economic accounts about activities and transactions undertaken by economic units that may be considered “environmental”. To support this analysis, SEEA provides standardized definitions for:

- environmental protection and resource management activity
- the environmental goods and services sector (EGSS)
- environmental taxes
- environmental subsidies

Measurement of environmental activities and transactions, in tandem with other elements of the framework (e.g., changes in ecosystem condition or residuals), can be used to assess the effectiveness of policy options and government investments.

Accounting for natural resources

Environmental assets may be measured from two different but complementary perspectives. In the first perspective various components of the biophysical environment are measured as individual environmental assets, commonly referred to as natural resources. These components include mineral and energy resources, soil resources, timber resources, fish and aquatic resources, other biological resources and water resources. The second perspective covers accounting for ecosystems and biodiversity (see SEEA Ecosystem Accounting).

For each natural resource, asset accounts record the opening and closing stocks and the additions and reductions in stock. Natural resources are valued only with reference to the income streams recognized in standard economic accounting (e.g. profits from the extraction of resources, royalty flows to governments, etc.).





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SEEA Ecosystem Accounting (SEEA EA)

Ecosystem Accounting (EA) complements the SEEA Central Framework by spatially identifying and mapping ecosystems and the services they provide and linking them to the economy. It accomplishes this in part, by relying on ecosystem boundaries instead of political boundaries used in the Central Framework. For example, instead of measuring just how much water each sector of the economy uses, Ecosystem Accounting maps areas of freshwater supply by analyzing surrounding watersheds and amount of water supplied from each source to ensure the supply can cover the demand used by sectors such as manufacturing or mining. The System of Environmental-Economic Accounting-Ecosystem Accounting (SEEA EA) was adopted as the international statistical standard for accounting for ecosystem and their benefits in 2021.

EA can be used as a long term monitoring tool to measure the status and health of ecosystems over time, types of ecosystem service benefits derived from ecosystems and their beneficiaries, trends in the capacity of ecosystems to provide benefits, and in the drivers and actors of change. Repeated over time as a regular statistics effort of a country, EA has the potential to consistently inform a wide policy and management practice spectrum that does not currently consider nature, using the same systems for economic assessment that countries currently use. As a system, it is the holy grail of valuing nature and it is gaining considerable global momentum and support.

The five ecosystem accounts (see fig 2) are:

1. **ECOSYSTEM EXTENT** accounts record the total area of each ecosystem, classified by type within a specified area (ecosystem accounting area). Ecosystem extent accounts are measured over time in ecosystem accounting areas (e.g., nation, province, river basin, protected area, etc.) by ecosystem type, thus illustrating the changes in extent from one ecosystem type to another over the accounting period.
2. **ECOSYSTEM CONDITION** accounts record the condition of ecosystem assets in terms of selected characteristics at specific points in time. Over time, they record the changes to their condition and provide valuable information on the health of ecosystems.
3. **ECOSYSTEM SERVICES FLOW** accounts (physical and monetary) record the supply of ecosystem services by ecosystem assets and the use of those services by economic units, including households.
4. **MONETARY ASSET** accounts record information on stocks and changes in stocks (additions and reductions) of ecosystem assets. This includes accounting for ecosystem degradation and enhancement.
5. **THEMATIC** accounts organize data around specific policy-relevant environmental themes, such as biodiversity, climate change, oceans and urban areas. Other important thematic accounts would include accounting for protected areas, wetlands and forests.

In practical terms, the approach enables direct assessment of potential to increase the flow of benefits by varying the extent of different asset types (e.g. reforestation) or investments in improvement of asset condition (e.g. restoration of soil health).

Equipped with this sort of information, for example, a primary producer can record the condition of their soil and assess the economic value of changing land use practices as a means to improve the value of that asset. Alternatively, they may be able to plan their land use to optimise a balance of high-biodiversity areas as a way to mitigate pest risks or increase pollination rates and so increase crop yields. Integrating environmental information allows a more complete set of trade-offs to be evaluated.

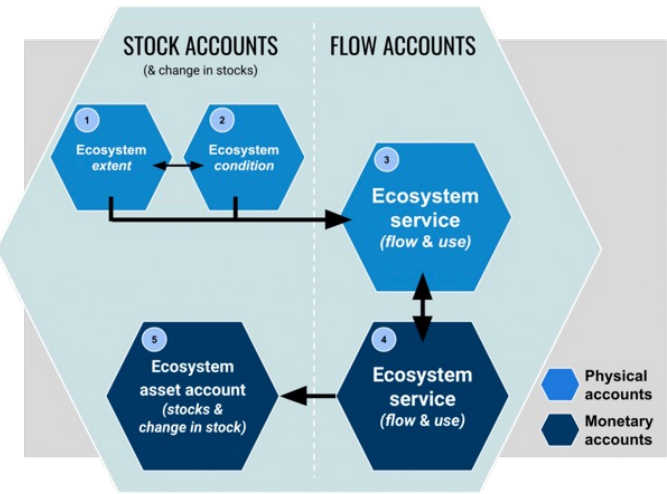


Figure 2. Sequence of the full set of ecosystem accounts (Source: United Nations et al. (2021)).

NCA & Conservation International

Conservation International (CI) is a leader in the applied research and development of a subset of NCA known as Ecosystem Accounting (EA). Our multidisciplinary science team and our strong field programs enabled us to be the first NGO to work with a country to pilot EA. With the national and local government, we undertook an EA pilot in San Martin, Peru.

By project's end, we had completed one of the most comprehensive and detailed EA pilots to date, quantifying ecosystem assets and their flows of economic benefits. Of many important findings, we established that San Martin's ecosystems provide a value of at least US \$70 million annually to the regional economy.

Beyond the Americas, CI is also applying EA, and NCA more broadly, in Africa, Asia, and the Pacific. In support of the [Gaborone Declaration for Sustainability in Africa \(GDSA\)](#), and in [partnership with NASA](#) we developed a low-cost, replicable approach and tools that countries can use to derive "ecosystem extent accounts" — an initial step toward full implementation of EA (see section on next page on "Implementing Ecosystem Accounting in Liberia").

We piloted this work in Liberia (more below), and are currently working on Botswana, and Gabon (all member countries of the GDSA). We are also working with Indonesia and the Philippines on EA efforts to inform development planning and market-based incentives for conservation. Early years of SEEA EA implementation have shown the advantage of a coherent and consistent statistics linking the environment to the economy, and pilots such as the CI-led in San Martin, Peru developed science that informed the standards.

Piloting Ecosystem Accounting: San Martin, Peru

CI, working in partnership with the Government of Peru, the Government of San Martin, and many other organizations, piloted the SEEA Experimental Ecosystem Accounting in San Martin, Peru from 2009-2013. The work generated extensive accounts of nature's various "values," including ecosystem classes covering forests, shrublands, grasslands, and fresh water. Ecosystem services accounts calculated also included timber, fresh water, bushmeat, firewood, water supply, sediment regulation, and ecotourism. We found that the natural ecosystems and their "assets" produced service flows valued at 191 million PEN in 2011 (about US \$70 million). Ecosystems also represented the eighth-largest economic sector in San Martin (the two largest sectors being agriculture and commerce), and the predominant beneficiaries of the ecosystem sector were households, receiving 98% of their



Park ranger in Alto Mayo Protected Forest located in the San Martín region of Peru.

Credits: Conservation International/Adrián Portugal





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Scaling up NCA Efforts Globally

The adoption of the SEEA EA as a global statistical standard in March 2021, on par with the System of National Accounts (SNA), was a colossal effort involving hundreds of global experts, and a major step forward toward broader implementation. CI played a leading role on the development of such standards, both as part of the UN Committee of Experts on Environmental-Economic Accounting (UNCEE) Technical Committee/Editorial Board, as well as the lead of the development of additional guidelines for accounting for biodiversity.

As international efforts shift rapidly towards implementation of the global standards, we are now experiencing a global demand for implementation. Indeed, over 100 countries expressed interest in NCA implementation and uses for policies, with climate, biodiversity, green growth, and jobs creation, ranking as highest important priorities.¹ In order to scale up efforts globally, we need commensurate innovation and a range of mechanisms that enables on-the-ground demonstration and triggers amplification. Such an effort would entail coordination between governments, intergovernmental agencies, and multilaterals (e.g., the UNSD, NASA, World Bank, GEF, GEO, etc.) on efforts that are consistent with the UN SEEA Implementation Strategy for the SEEA Ecosystem Accounting.² Some of those would include:

- resource mobilization and access to programmatic funding mechanisms designed to support global implementation (e.g., through GEF, GCF, and bilateral funding);
- access to ecosystem account data platforms as well as rapid and standardized ecosystem accounting tools;
- capacity building that support technology transfer; and
- mainstreaming of SEEA EA indicators into global policy, with a focus on Multilateral Environmental Agreements (MEA) monitoring (e.g., SDGs, the CBD post-2020 Global Biodiversity Framework, UNFCCC Paris agreement, etc.).

Implementing Ecosystem Accounting in Liberia

In February 2020, Liberia formally began its journey towards developing national ecosystem accounts. The Liberia Environmental Protection Agency (EPA), in partnership with other governmental agencies, and support from Conservation International, started implementation of the GEF-funded project “Conservation and Sustainable Use of Liberia’s Coastal Natural Capital” project. Broader project objectives include mainstreaming the value of nature and its benefits to its citizens into Liberia’s development trajectory, while building the statistical infrastructure and capacity for the Liberian government to conduct ecosystem accounting as an integral part of the national statistics efforts.

In advance of project implementation, CI, NASA and the Government of Liberia combined earth observations with field-collected biodiversity and environmental data to produce ecosystem maps for each year between 2000-2018 that show the extent of each ecosystem type and how they have changed over time (Figure 3). Constructing these ‘ecosystem extent’ maps is the first step in ecosystem accounting and provides the foundation for quantifying, mapping, and sustaining the sources of nature’s benefits to people.

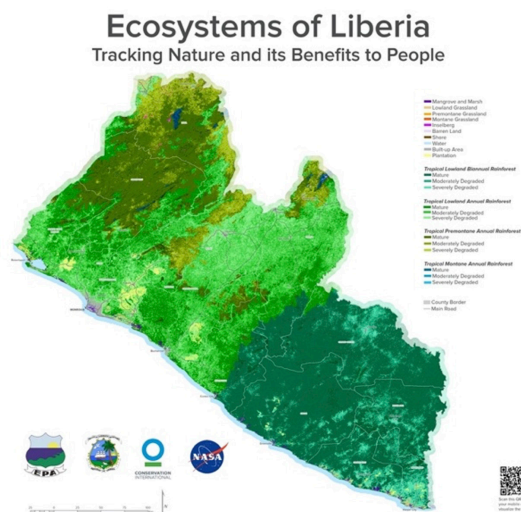


Figure 3. Ecosystem extent map of Liberia 2000-2018.

For more information:

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¹ See https://unstats.un.org/unsd/statcom/52nd-session/documents/BG-3f-2020_GA_report_%20draft_%20over7_nomap-E.pdf

² See https://seea.un.org/sites/seea.un.org/files/seea_ea_implementation_strategy_draft_11june.pdf