DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS
STATISTICS DIVISION
UNITED NATIONS

System of
Environmental
Economic
Accounting

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Extraordinary Meeting of the UN Committee of Experts on Environmental-Economic Accounting

16 and 18 November 2020

Background Document
How Natural Capital Accounting/SEEA Experimental Ecosystem Accounting Supports Policy Making

The objective of this document is to provide an extensive reference list and review natural capital accounting/SEEA-EEA applications and the extent to which they have informed (or are expected to inform) policy. It was in first instance prepared as a background for the IPBES Values Assessment, but may also prove context for the UNCEEA discussion on the status of ecosystem accounting.

How NCA / SEEA EEA supports policy making

***Supporting document / references to inform IPBES Values Assessment – B. Edens[1] - *** *draft Oct 2020*

1. Introduction

The first environmental-economic accounts were developed in the 1970s, and the field has greatly expanded since it started in the 1970s, sometimes known under different names (e.g. natural capital accounting, natural resource accounting, green accounting, wealth accounting, environmental accounting,) – (see Text box below on SEEA history). Several earlier reviews exist (Lutz and Peskin 1993, Hecht et al., 2005, Vanoli, 2005). While the intent of the SEEA was always to focus on measuring the interrelationship of the environment and the economy, this has gradually shifted from a focusing on adjusting aggregates such as GDP (actually NDP – Net Domestic Product) to take cost of depletion and degradation into account, towards estimating measures of wealth including natural capital, that forms the productive base of economic activity. Hereto, the measurement boundaries have also been adapted over time, with the ecosystem accounts adjusting not just the asset boundary but also the SNA production boundary in order to recognize the generation of ecosystem services.

The objective of this background document to the IPBES Values Assessment is to provide an extensive reference list and review natural capital accounting[2] applications and the extent to which they have informed (or are expected to inform) policy. Given the thematic scope of the IPBES, we will focus here on the ecosystem accounts, so policy applications of the SEEA CF (e.g. on environmental taxes / subsidies; green jobs; resource productivity) will not be assessed. The scope will also be restricted to ecosystem accounting efforts undertaken within the public sector (e.g. National Statistical offices, government agencies, academia) recognizing that there is also a growing interest in NCA in the private sector including the application of ecosystem accounting principles e.g. see IDEEA (2018), on pilot study with a forest company.

This is not a systematic review, as the ecosystem accounting field itself is large and expanding quickly. The intent is to bring together and assess from a policy angle a range of materials (some of it in the grey literature) that have in common that they depart from the SEEA EEA (UN et al 2014) handbook. Some of

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[1] The author can be contacted at: bram.edens@un.org. Additional references and examples are very welcome.
[2] "Natural capital accounting (NCA) is an umbrella term covering efforts to use of an accounting framework to provide a systematic way to measure and report on stocks and flows of natural capital. Its underlying premise is that since the environment is important to society and the economy, it should be recognised as an asset that must be maintained and managed, and its contributions (services) be better integrated into commonly used frameworks like the System of National Accounts. NCA covers accounting for individual environmental assets or resources, both biotic and abiotic (such as water, minerals, energy, timber, fish), as well as accounting for ecosystem assets (e.g. forests; wetlands), biodiversity and ecosystem services. The System of Environmental Economic Accounting (SEEA) is the accepted international standard for environmental-economic accounting, providing a framework for organizing and presenting statistics on the environment and its relationship with the economy" – copied from seea.un.org/content/frequently-asked-questions#What%20is%20natural%20capital%20accounting

these efforts are undertaken and/or published by statistical agencies), others are carried out by academia and can be characterized as research (e.g. published in scientific journals). In line with IPBES broad assessment of values, the studies assessed here go beyond the monetary valuation of ecosystem services and assets. In fact many of the accounts used in policy are in biophysical units.

Text box – brief history of environmental economic accounting (paraphrased from Edens 2013)

The origins of environmental accounting can be traced to the (late) nineteen seventies, when several European countries initiated work independently of each other (Hecht 2005, p.9). In 1978, the Norwegian Environment Ministry commissioned Statistics Norway to develop natural resource accounts as a tool to better manage natural resources and the environment due to growing environmental concerns because of intensive expansion of hydropower, overexploitation of fish stocks and the discovery of significant oil and gas reserves (Alfsen, 1996, p.5). Denmark was an early adaptor, when it started the compilation of energy flow accounts triggered by the 1973 oil crisis to address issues around energy saving and improving of energy efficiency. In the 1980s, France developed an accounting system to assess, both quantitatively and qualitatively, the state and evolution of its 'natural patrimony' (Vanoli, 2005, p.344). These initial efforts have in common that they were focused on obtaining physical descriptions of natural resource use.

Regarding monetary descriptions, according to Vanoli (2005, p.294) it was not until the second part of the 1980s that the focus was really placed on adjusting indicators such as GDP and NDP for the use of natural capital, rather than obtaining asset values. This development was influenced by growing concerns that these indicators did not properly take the depletion and degradation of natural assets into account as a result of economic activity.

In developing regions, during the 1980-ies, the World Bank and the United Nations Environmental Programme (UNEP) sponsored several workshops (see Ahmad et al., 1989), which led to the conclusion that 'enough progress had been made to link environmental accounting to the .. SNA' (Lutz, 1993). A highly influential study was undertaken by the World Resources Institute (Repetto et al., 1989) which estimated the depreciation costs of Indonesia's natural resources and showed that this would lead to a significant downward adjustment of its growth rates. Between 1989 and 1992, the World Bank and UNSD conducted several pilot country studies (e.g. Mexico, Papua New Guinea), in order to test the accounting framework that was under development, which was eventually published by the United Nations as Handbook of National Accounting: Integrated Environmental and Economic Accounting (1993 SEEA: UN, 1993).

The "Earth Summit" held in 1992 in Rio de Janeiro was a major stimulus for environmental accounting as it called in its Agenda 21 (UN, 1992) for "establishing systems for integrated environmental and economic accounting .. in all member States at the earliest date, with the main objective to expand existing systems of national economic accounts in order to integrate environment and social dimensions in the accounting framework". As the preface of the 1993 SEEA clearly states, the handbook was work in progress, and there was a clear need to continue conceptual discussions. To this end the statistical community established the London Group on Environmental Accounting, a forum for expert practitioners, from the increasing number of countries (both developed and developing) that had started environmental accounting programs.

In 2003 the SEEA 2003 was published (UN et al., 2003). Although the SEEA 2003 was a major step forward, it still did not provide unique recommendations on a number of issues. Therefore, the UN Statistical Commission agreed at its thirty-eighth session in February 2007 to start a process with the aim of developing the SEEA into an international statistical standard. Hereto, the United Nations Committee of Experts in Environmental and Economic Accounting (UNCEEA) was established. The SEEA Central Framework (SEEA CF, UN et al., 2012) was adopted as an international statistical standard by the UN Statistical Commission in 2012, with the SEEA Experimental Ecosystem Accounting (SEEA EEA, UN et al., 2014) recognized as state of the art conceptual framework that can be used by countries for further testing and experimentation, during the 44th session of the UN Statistical Commission in early 2013. Currently work is ongoing to revise the SEEA EEA into an agreed framework for adoption during the UNSC in early 2021.

There are various good starting points to assess policy uptake on NCA/SEEA, most notably:

- 4 Policy Fora organized by the World Bank (WAVES, later GPS), in collaboration with other agencies including the UN Statistics Division, PBL, and the Capitals Coalition) on "Natural Capital Accounting for Decision-Making, with their respective proceedings (Vardon et al. 2017; Vardon and Ruijs, 2018; Vardon et al 2019; Vardon and Bass 2020).

- The UNSD knowledge base on SEEA https://seea.un.org/content/knowledge-base and World Bank's WAVES/GPS knowledge center on NCA https://www.wavespartnership.org/knowledge-center - both contain a category "policy briefs".

- Several country specific reviews (e.g. Oosterhuis et al. 2016 that assess the policy impacts of the Dutch water and energy accounts; Advisory committee 2002, that described the findings of a committee that was in place for over a decade to advise on the development of the German accounts).

- In addition, a number of specific articles have reflected upon accounts versus policy discourse (e.g. Vardon, Burnett, Dovers, 2016).

The reviews indicate that early compilation attempts (and this applies to the SEEA at large) often developed independently from the intended users of the accounts (Vardon et al 2016). They were in accountants' parlance often "supply driven" and to a lesser extent "demand/policy driven". This characterization concurs with the findings of a recent review by the European Court of Auditors on environmental-economic accounting in the EU (EC, 2019), which concluded that "the Commission and the Member States proposed whether the EEEA [European Environmental-Economic Accounts] modules would be mandatory or not largely on the basis of data availability and maturity and considerations of the administrative burden in the Member States, rather than on compiled data needs."

On the other hand, the picture that also emerges from these reviews is that first of all the supply driven nature of accounts development is changing: in fact there exist a lot of successful examples of policy uptake, which we will review in more detail in section. Second, the ecosystem accounts seem to follow a more participatory process including stakeholder consultation, in part because of its multi-disciplinary nature which necessitates collaboration across various agencies.

Country implementation strategies for NCA/SEEA advocate the establishment of oversight committees with stakeholders to guide the process of accounts compilation (UN 2020 Chapter 2, forthcoming) .

To further mainstreaming of NCA the first NCA Policy Forum held in the Hague led to the formulation of 10 tentative principles for NCA to ensure it is fit for policy purpose.[3] Second, there is strong agreement on the significant potential of the accounts for policy making, as evidenced by:

- National level:

    - Several countries (e.g. the UK and Italy[4]) have established high-level committees (e.g. well known is the UK's Natural Capital Committee) to guide this mainstreaming

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[3] NCA is fit for improving policy if it is Comprehensive: 1. Inclusive 2. Collaborative 3. Holistic. Purposeful: 4. Decision-centered 5. Demand-led. Trustworthy: 6. Transparent and open 7. Credible. Mainstreamed: 8. Enduring 9. Continuously improving 10. Embedded.
[4] https://www.minambiente.it/pagina/capitale-naturale

process.[5] A good example from India is the Committee on Greening the Accounts (MOSPI 2013).

- o Several countries have established a legal basis for compiling the accounts (e.g. Mexico; Philippines[6]; more recently Brazil[7]) or have developed a comprehensive SEEA strategy and action plan (Commonwealth of Australia 2018).

- o China is working towards standardization of GEP Accounting.[8]

- A the supra national (regional) level:

  - o The EU has since 2011 a legal base for environmental-economic accounting.[9] The EU Court of Auditors report mentions "The EEEA modules were not used to their full potential for monitoring key environmental policies."

  - o The 17th Session of the African Ministerial Conference on the Environment (AMCEN) in Durban, South Africa, 2019 "recognised the potential of NCA to making the case for the biodiversity economy, and noted that knowledge of SEEA EEA would support mainstreaming biodiversity and ecosystems at the subnational and national levels, as well as policy planning and implementation." (AMCEN Secretariat 2019)

- At the global level:

  - o SEEA was already recognized in Agenda 21 (Rio 1992 outcome document) – UN 1992.

  - o More recently, the UNEA endorsed a resolution on NCA (2015).

  - o In 2012, The Gaborone Declaration for Sustainability in Africa (GDSA) was signed by 10 African heads of state (since grown to 14), with as objective "To ensure that the contributions of natural capital to sustainable economic growth, maintenance and improvement of social capital and human well-being are quantified and integrated into development and business practice."[10]

  - o UN Statistical Commission has recognized the SEEA as a useful tool to inform SDG indicators and in particular the SEEA implementation is now also one of the SDG indicators to measure the target on mainstreaming biodiversity in policy and accounting.

In addition, there are also various document that are more forward looking and explore the various pathways through which NCA may inform various policy domains.

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[5] https://www.gov.uk/government/groups/natural-capital-committee

[6] "In 2013, with the enactment of Republic Act No. 10625, otherwise known as the Philippine Statistical Act of 2013, the Philippine Statistical Authority (PSA) was established. The Law mandates the PSA to compile environment statistics and environmental accounts and thus established a unit dedicated for the task." - https://psa.gov.ph/environment/title/FDES%20in%20the%20Philippines

[7] https://seea.un.org/news/brazil-use-seea-calculate-green-domestic-product - although this Decree has not been implemented to date.

[8] https://seea.un.org/sites/seea.un.org/files/1._gross_ecosystem_product_and_ecological_assets_0.pdf

[9] The scope currently is on SEEA CF accounts, but the intent is to add ecosystem accounts in the near future.

[10] http://www.gaboronedeclaration.com/about

- The ENHANCA project "Enhance Natural Capital Accounting Policy Uptake and Relevance (EnhaNCA)" which has as main objective to provide materials to increase policymakers' understanding of applications of NCA according to the SEEA.[11] The results consist of an overview paper Hoekstra (2020), and topical papers on macro-economic policies (Agarwala and Zenghelis, 2020), biodiversity policy (Pizarro, 2020), and climate change (Coates et al., 2020).

- EC 2015 - The added value of NCA for Policy making.

The picture that emerges from these reports can be summarized as follows. Many of the challenges countries face today are highly interconnected across domains (economic, social, environmental), across stakeholders, and scales (local, national, global) (Hoekstra et al 2020). To address these issues effectively, integrated policy frameworks and solutions are required (such as the SDGs or the post 2020 biodiversity strategy). The SEEA is an integrated information system that can support policy makers in addressing these challenges.

2. **Policy application of NCA**

A lot of successful examples exist already of use of NCA for policy making. In this section we will summarize selected examples in global policy; national policy – distinguishing between macro-economic policies; biodiversity policies; climate change as well as sectoral policies.
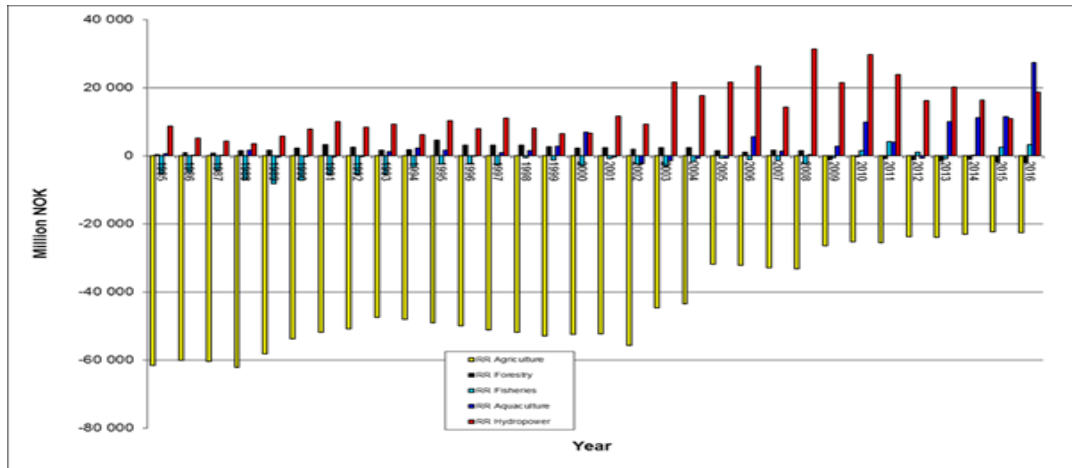
2.1 Wealth.

The total wealth and its composition and trends over time, provide useful indicators for countries to track their path towards sustainability. Wealth accounts are best suited for macro-level applications. Well known are the global reports from the World Bank on the Changing Wealth of Nations (CWON – Lange et al. 2018) and reports commissioned by UNEP on Inclusive Wealth (Managi and Kumar (Eds) 2018). Recently, these wealth accounting efforts have also started to include estimates for selected ecosystem services. The wealth accounts are also used to inform the Banks's lending practices. In addition to global data sets, there are also several national application of wealth accounting, such as in Uganda (e.g. Uganda Natural Capital Accounting Program (2019), Canada and Norway.

Statistics Norway calculates resource rent for provisioning services of agriculture, forestry, fisheries, aquaculture and hydropower (Greaker, 2016; Greaker et al., 2017, 2016, 2005; Grimsrud and Greaker, 2013). Resource rent is calculated as the value of production subtracting costs, of labour, raw materials, capital costs, taxes and subsidies. According to resource rent calculations using SNA-numbers agriculture has historically had negative resource rents for the past 35 years. Hydropower has historically had positive and since 2000 increasing resource rents. Forestry has gone from positive to negative resource rents at about 2010 (Figure 1). Norwegian fisheries contributed negatively to the national wealth in the period 1984–2016 with exception of the years 2010–2011 and 2015–2016. Resource rents have also been used to estimate asset values of natural capital (Greaker 2008).

Figure 1. Resource rents for provisioning services from renewable resources in Norway

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[11] Specifically, (a) A lack of awareness by policy makers on the value added of NCA and how it can address policy needs; (b) A lack of systemization of the potential applications of NCA; and (c) A lack of compelling case studies on the impact of NCA policy applications.

Source: Grimsrud and Greaker (2013)

Canada – IISD (2018) contains an analysis of the evolution of Canada's comprehensive wealth between 1980 and 2015, showing that GDP and wealth are on different trends, and hence complementary measures for balancing short-term and long-term objectives.

2.2. **Consumption perspective / footprints**

Due to their alignment with National Accounts environmental-economic accounts are widely used in so-called environmentally extended Input-Output analysis that allow a shift of analysis from a production to a consumption perspective, for instance to analyse the footprint (carbon or water) of a country's consumption pattern. Several global applications exist (so-called multi-regional I-O tables (MRIO), such as GTAP; EXIOBASE; EORA; WIOD. While these data bases usually assess more traditional environmental aspects as captured in SEEA CF accounts (e.g. carbon, water, energy) they have also been applied to assess biodiversity impacts of trade (Lenzen et al. 2012).

More recently, due to the development of ecosystem accounts, I-O analysis has also been applied in combination with ecosystem accounts:

- Kleeman et al. (2020), quantified for Germany, interregional flows of four ecosystem services and conclude that "Germany´s prosperity depends on ecosystem services supplied abroad".

- La Notte et al (2020), as part of the LISBETH[12] project, describe practical examples of the use of natural capital accounts in economic analytical tools, such as the water purification service embedded in traded crops, and the impacts of invasive alien species on pollination dependent crops.

2.3 **Macro-economic policy / indicators**

China has developed Gross Ecosystem Product (GEP) accounting as complementary measure to GDP to quantify the value of the contributions of nature to economic activity as part of its transition towards inclusive green growth (Ouyang et al 2020). GEP accounting has been used to inform a range of decision-making contexts, including eco-compensation policies, for ecological red-lining, and for evaluating government performance in key designated zones.

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[12] The acronym LISBETH stands' for LInking accounts for ecosystem Services and Benefits to the Economy THrough bridging.

Mexico's System of environmental economic accounting (SCEEM)[13] provides information on the impacts of economic activities on the environment and natural resources of the country and links those to macroeconomic variables (national accounts) by estimating the costs of natural resources depletion and environmental degradation and expressing these in relation to the country's Gross Domestic Product (in the form of an Ecologically-Adjusted Net Domestic Product, PINE). The work predates the ecosystem accounts, and has a strong focus on central framework, but is included here as there is an overlap between SEEA CF and SEEA EEA when it comes to provisioning services (e.g. water).

Figure 2 below shows the latest figures reported by Mexico's SCEEM for the last ten years.

Fig.2 Mexico's Environmental and economic accounts
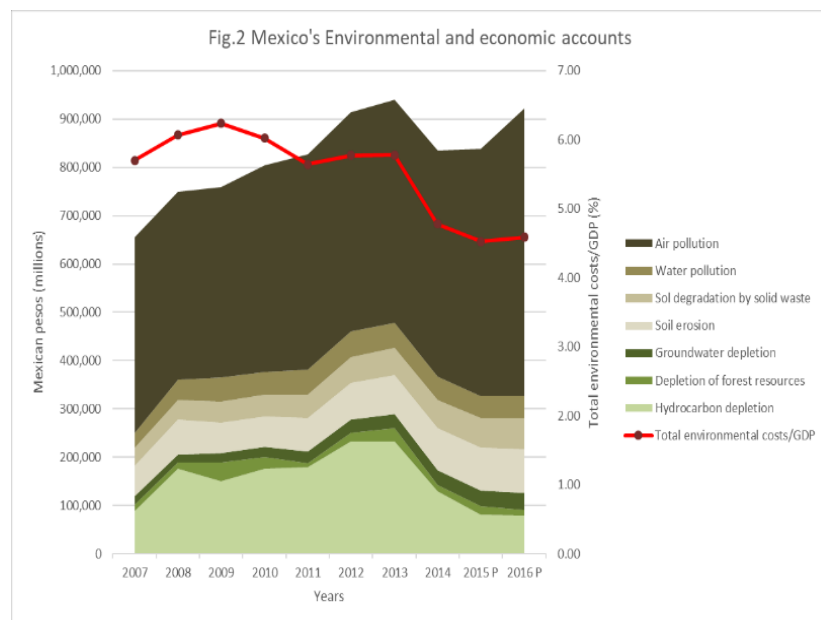
Mexico's Environmental and economic accounts (SCEEM) for the period 2007-2016 (base year: 2013). The SCEEM is a satellite account of Mexico's System of National Accounts that accounts for the use (and depletion) of natural resources and environmental degradation in the country's economic and productive processes. Costs of environmental degradation (air, water and soil) are displayed in shades of brown; components shown in shades of green represent the costs of natural resources depletion (hydrocarbons, forests and ground water). For comparison, the red line shows total environmental costs as a percentage of the country's GDP. Figures for the years 2015 and 2016 are preliminary estimates.

INEGI's SCEEM provided the basis to project the costs of environmental degradation and natural resources depletion over the period 2010-2100 under various climate change scenarios and thus estimate the economic impacts of climate change in Mexico (SEMARNAT, 2009). Mexico's *National Development Plan 2001-2006*[14] chose PINE as one of the indicators to assess the sustainability of Mexico's economic growth (DOF, 2001). Similarly, the *National Development Plan 2007-2012* pointed out that, over the period 1996-2003, the annual monetary cost of environmental degradation amounted to as much as 10.4% of the country's GDP on average and that, were this trend to continue, the country's economic growth and the Mexicans' well-being would be compromised. The *National Development Plan 2013-2018* (NDP 2013-2018) pointed out that, in 2011, the cost of environmental depletion and degradation in Mexico amounted to as much as 6.9% of the country's GDP and that this "…imposes major challenges to promote economic growth and development at the same time that ensuring that natural resources continue providing the environmental services upon which the

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[13] This text is paraphrased / copied from a technical report written by S. Sanchez Colon – project consultant to NCAVES Mexico, 'Country Assessment Report" (unpublished).

[14] In Mexico, the National Development Plan (NDP) is produced every six years at the onset of the new presidential administration. The NDP sets the National Goals and provides a blueprint for programming and budgeting across the entire federal administration. The NDP is also the basis for the formulation of the federal sectoral programmes of work; these include, among others, the Sectoral Programme of Environment and Natural Resources (PROMARNAT).

Mexicans' well-being depends…" (DOF, 2013). Accordingly, the environmental sectoral programme (PROMARNAT) derived from NDP 2013-2018 has adopted INEGI's total cost of environmental degradation and depletion as the main indicator for the programme's "Objective 5.- Halt and revert the loss of natural capital and water, air and soil pollution", and has set the target of reducing this indicator to 4.5% by 2018.

India – The 14th Finance Commission when formulating its tax allocation policy with states for the period 2015-2020 has included forests as an additional new parameter, rewarding states for increasing forest cover.[15] While these parameter were not derived from forest accounts as such, discussion are ongoing on the role to use NCA for tax distribution policies.

Colombia - "With WAVES support, Colombia has produced water, land, and timber/forest accounts at the national level; ecosystem accounts at the regional level; and land, water, and expenditure accounts at the watershed level. These accounts make it possible to better assess the real value of natural capital to the economy.. Natural capital represents 13 percent of national wealth and income in Colombia." "The accounts provide information to support Colombia's Green Growth National Strategy. The focus is on three areas: reducing deforestation, cutting greenhouse gas emissions, and strengthening climate change adaptation. Natural capital accounting has also been included as a tool for the National Development Plan 2014–2018" (quotes from: https://www.wavespartnership.org/sites/waves/files/kc/Colombia%20offer%20doc_FINAL.pdf

2.4 Biodiversity

Norway - The Nature Index is a spatially explicit species based indicator for state and development of biodiveristy in Norway with national coverage for 9 major ecosystem types. https://www.naturindeks.no/ The basic spatial unit is the municipality with trend statistics compiled at county level or higher. The Nature Index has tracked biodiversity state and development for the years 1990-2000-2010-2014. The Norwegian nature index will be updated in 2020. It has been reviewed internationally as a "species account"(King et al., 2016) , but should be evaluated for its potential to fulfill SEEA EEA recommendations for ecosystem condition accounts.

South Africa – as part of the NCAVES project – has compiled species accounts (for Rhino + Cycads). These accounts bring together in a structured way integrating multiple data sources how stocks of these species have evolved over time. The species accounts are currently in a draft final version but have already been presented to, and well received by, the South Africa national Scientific Authority for CITES convened by SANBI to assist with regulating trade in species, including CITES-listed species such as black and white rhino. Such species accounts could also be explored for providing information for reporting on targets being developed in the Post-2020 Global Biodiversity Framework. There is also interest in South Africa to compile information on the size of what is called the 'biodiversity economy'.

Brazil – account for threatened species (forthcoming November 2020) contain stock accounts detailing the development of various groups of endangered species in Brazil (broken down by biome) based on information on international and national Red List of Species data. The Red List Index is calculated by group of species and biome. In the spatial analysis the changes in the index are related to changes in

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[15]See: https://india.mongabay.com/2019/12/are-states-being-rewarded-enough-for-protecting-forests-finance-commission/

land cover, distinguishing between natural and modified land cover. These accounts can be used to inform biodiversity policies.

Peru – St Martin. As part of the Ecosystem Values and Accounting program, pilot ecosystem accounts were developed for St Martin, led by Conservation International (CI) in close partnership with the Government of Peru and other partners (Sam Martin and CI 2016). Due to the spatial nature of the developed indicators used in the ecosystem accounts, they can be usefully applied for landscape planning. Based on this an ecosystem benefits indicators (EBI) was developed after transforming each key indicator from the EVA's ecosystem accounts into a benefit measurement, that uses these various layers for MCA multi criteria analysis. (based on: https://seea.un.org/sites/seea.un.org/files/s10-description_of_ecosystem_benefits_indicators.pdf). An important policy uptake in Peru has been the use of accounting information in preparation of forest zoning in San Martín Region, which is now an official document.

2.5 Climate change

Netherlands - the Netherlands have developed a comprehensive suite of ecosystem accounts. The accounts have supported policy making on sustainable land use and were used extensively in political debate (Hein et al. 2020). Specifically, the carbon accounts have quantified emissions from soil subsidence, which were greater than previously known, which has had an impact on water management regimes.[16]

Indonesia: "The Government of Indonesia compiled ecosystem accounts for peatlands, with support from the World Bank Global Programme on Sustainability. Ecosystem extent accounts illustrated that 52 per cent of peatlands in Kalimantan and Sumatera were converted between 1990 and 2015, often to plantation or agricultural lands. In addition, ecosystem service accounts showed that while these conversions led to an increase in ecosystem services related to the production of oil palm fruit, acacia, rubber and timber, they also led to a large decrease in carbon sequestration services (as shown through carbon accounts). Indonesia's peatland accounts can play an important role in informing Indonesia's policymakers. Already, Indonesia is starting to prioritize the restoration of degraded peatlands, with the formation of the Peat Restoration Agency in 2016 and specific targets for peatland restoration. The spatially explicit ecosystem extent accounts for peatlands can help pinpoint the specific areas which should be prioritized for rehabilitation. The accounts also have an important role in identifying the physical and monetary impacts of peatland rehabilitation. In addition, the carbon accounts can support the National Action Plan to Reduce GHG Emissions, by monitoring carbon emissions from peatland." (Pizarro, R 2020).

Liberia – while still at the beginning phases of accounting, the accounts have contributed to Liberia's National Determined Contributions (NDC) processes as follows: the ecosystem extent map developed through a CI-NASA partnership helps with the measuring of sectoral contributions of CO2 emission and sequestration (e.g. coastal, forestry, agriculture sectors); by providing statistical information in design, planning and monitoring of NDC targets, activities and indicators; supporting NDC by providing recommendations on best practice methodologies on field data collection for measuring co-benefits and

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[16]

https://seea.un.org/sites/seea.un.org/files/files/documents/2020/Apr/illustration_seea_eea_support_policy_carbon_nl.pdf

human wellbeing. Beyond the NDC process, ecosystem accounts are also contributing a.o. to the 2nd Liberia State of the Environment Report and Liberia's wildlife laws.[17]

2.6   Sectoral policies

South Africa has developed condition accounts for its rivers (SANBI et al 2016). A key finding from the river accounts is that the ecological condition of South Africa's rivers declined by 10% from 1999 to 2011. This information is helping inform the National Water and Sanitation Master Plan, currently being developed by the Department of Water and Sanitation, which highlights the importance of maintaining the integrity of freshwater ecosystems as part of the water value chain. The accounts also have identified the areas where the decline in river health has been most pronounced so that solutions can be identified to better manage catchments and rivers to support economic and social development.

United Kingdom – Public forest management in England. Forestry England has published an annual natural capital account (see Forestry England 2019 for the latest version), see also ONS (2019) for the English accounts. The natural capital account contains an asset register (Extent and condition), as well as ecosystem service flow account (in physical and monetary terms), with the latter being used to compile a balance sheet including natural capital. These accounts have helped a.o. to: "Demonstrate the societal value delivered by England's woods and forests and the management of them by Forestry England; Inform decision making at all levels by clearly linking management with the value of our natural capital assets; Assess our decision making's impact on natural capital values, in both the long term and short term."

China: "The results generated by the CEA [China ecosystem assessment - author] have already been applied by policy-makers in China at national, provincial, and local levels, by several parts of government (e.g., Ministry of Environmental Protection and the National Development Reform Commission). For example, 49.4% of China's land area (4.74million km2 over 63 locations) has been newly incorporated into Ecosystem Function Conservation Areas (EFCAs), designed to secure the nation's most vital natural capital, on the basis of CEA's characterization of important source areas for ecosystem service provision. EFCAs include areas that provide 77.7% of carbon sequestration services, 75.3% of soil-retention services, 60.7% of sandstorm-prevention services, 76.8% of water-retention services, 60.2% of flood mitigation services, and 67.6% of natural habitats. The CEA also informed the national-level policy of ecological protection red-lining (EPR) that designates lands for strict protection to ensure sustainable provision of ecosystem services. The national EPR, as well as EPR planning, in provinces and localities was based on priority sources of ecosystem services and covers 34.4% of the area of China ... The results of the CEA have also been applied in national transportation network planning to identify sensitive areas for protection when designing road projects ..." – excerpts from Ouyang Z.Y., H. Zheng, et al. Improvements in ecosystem services from investments in natural capital. Science 352, 1456-1459 (2016).) [18] Strictly speaking, the research undertaken here by the Chinese Academy of Sciences has occurred in parallel with the development of SEEA EEA, but it is included here as recent meetings have concluded that the GEP and SEEA conceptual frameworks are aligned, although some differences exist in application/measurement exist, but these are mostly due to data availability.[19]

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[17] Personal communication from CI.

[18] https://news.cgtn.com/news/2019-09-20/Promoting-ecological-preservation-with-a-national-red-line-K94rIl9Rkc/index.html

[19] https://seea.un.org/Expert%20Meeting%20on%20Aligning%20SEEA%20and%20GEP

Rwanda: "In Rwanda's case, the stabilization of ES losses in the 2000s appeared to indicate success in balancing economic development, poverty reduction and environmental protection. However, ES gains have reversed since 2010, showing the challenge of sustaining natural capital in the face of rapid economic and population growth (e.g. Marques et al., 2019). As the Government of Rwanda contemplates ambitious future policies such as the upcoming National Strategy for Transformation I (the successor to EDPRS) and Vision 2050, ecosystem accounts can help track progress, quantify trade-offs, and set realistic baselines from which to develop comprehensive and linked environmental-economic policies. Furthermore, ecosystem accounts can illustrate linked trends and previously unidentified trade-offs in the environment, economy and human well-being of other rapidly changing African nations." (based on: https://www.wavespartnership.org/en/knowledge-center/rwanda-ecosystems-accounts-1990-2015 /; Bagstad et al 2019 https://besjournals.onlinelibrary.wiley.com/doi/10.1002/pan3.10062).

Uganda: "The Land Physical Accounts for Uganda were developed to contribute to the goal of the National Land Policy (2013). The goal of the policy is to ensure an efficient, effective and optimal utilization and management of land resources for poverty reduction, wealth creation and overall socioeconomic development. Land is a key strategic asset for Uganda as it contributes over half of the value of the asset basket of poor Ugandans (GoU 2017)." Based on:- https://www.wavespartnership.org/en/knowledge-center/land-physical-asset-accounts-uganda-brief

Guatemala: "The forest accounts for Guatemala measured the extent of deforestation and identified its main causes: agricultural expansion, urban development, uncontrolled timber harvesting and the use of fuelwood. These findings led government to strengthen the regulatory capacity of public agencies responsible for forests." – based on: https://www.wavespartnership.org/en/knowledge-center/policy-briefing-nca-supports-stronger-forest-policies

Philippines - "Using ecosystem accounts developed for the Laguna de Bay Basin—the watershed for the country's largest lake, in metropolitan Manila—the Laguna Lake Development Authority (LLDA) has created a scorecard for local government units to assess environmental conditions and is using the information to update the Laguna de Bay Master Plan. Preparing the accounts provided a platform for data transparency between governments and local stakeholders, which will facilitate implementation of ensuing policies" - https://www.wavespartnership.org/en/knowledge-center/natural-capital-accounting-and-policy-philippines

Costa Rica[20] – "Costa Rica has prepared three main accounts—for forests, water, and energy—using the United Nations System of Environmental-Economic Accounting (SEEA). Results from the first set of accounts will start to reveal the value of natural capital's contributions to society. This data will help to define the country's policies into the future." "Forest accounts show growth in forest cover. There was an increase of some 97,600 hectares in cover between 2011 and 2013, equivalent to 244 million tons of carbon stored in forests. This information has contributed to the government's strategy on reducing emissions from deforestation and forest degradation (REDD+), a key component of its National Plan for Forest Development 2011–20. The forest accounts have supported the design of Costa Rica's Payment for Environmental Services program." "Creating the accounts helped institutionalize the approach and the availability of data. The data have been well disseminated and are available as Excel files on the Central Bank website. The process of preparing the accounts was fully integrated into the Central Bank national accounting process. Background studies made sure the information was developed with a clear understanding of the components that link resources to users: institutions, legislation, and policies. The Ministry of Environment is moving on to advocacy to encourage the use of the accounts." – (based on:

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[20] Strictly speaking these accounts are based on the SEEA CF, but have been included here because of the overlap with SEEA EEA.

https://www.wavespartnership.org/en/knowledge-center/natural-capital-accounting-and-policy-costa-rica

Canada - Grenier et al. (2020) contains a test case for compiling urban ecosystem accounting for Milton, Ontario. It states that "The development of better spatial data to support urban ecosystem accounting will help inform policy and investment decisions related, for example, to the identification and development of mitigation measures for climatic and hydrologic impacts (i.e., those relating to urban heat islands and energy consumption, air pollution, increased runoff, modified streamflow dynamics, or water quality) at a regional scale across the country; and in this way will contribute to the health, security and well-being of Canadians."(ibid)

Finally, national pilots on ocean accounting have been undertaken in a range of countries (China, Canada, Malaysia, Samoa, Thailand and Vietnam) "to test the framework and to strengthen national capacities and partnerships to achieve SDG14." (based on: https://communities.unescap.org/environment-statistics/tools/regional-ocean-accounts-platform)

3. **Indicators and monitoring**

In addition to informing various types of policy discussed in Section 2, an important function of the accounts is also to use them for monitoring and deriving indicators.

A recent assessment (UNEP-WCMC) has found 54 full possibilities for alignment of global indicators with the SEEA (UNEP-WCMC 2019). As shown in Figure 1 – a wide range of SDGs can be informed by the SEEA (UNCEEA 2018).

Figure 3: Goals supported by SEEA.

In the EU context several indicators derived from the accounts are used as headline indicators (e.g. in the EU SDGs or resource efficiency strategy).[21]

A recent editorial in Nature (2020) stated: "The biodiversity convention's member states have to publish biodiversity action plans — but these are often statements of a country's ambitions, rather than records of its achievements. For the next set of goals this has to change, and fortunately there seems to be a

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[21] https://ec.europa.eu/eurostat/statistics-explained/index.php/Resource_productivity_statistics

way forward. This is the UN System of environmental Economic Accounting (SEEA), a mechanism for reporting environmental data, and it needs to become the global standard for environmental reporting."

An important development is also that the number of countries implementing the SEEA is being used for reporting on SDG Target 15.9 "By 2020, integrate ecosystem and biodiversity values into national and local planning, development processes, poverty reduction strategies and accounts".[22]

TO INCLUDE - Chapeau of the monitoring framework for the post 2020 biodiversity agenda when it is released.

4. **Conclusion**

NCA (specifically ecosystem accounting) is a relatively new development with the SEEA spectrum of accounts, made possible due to technical advances (e.g. Artificial Intelligence, global platforms, Earth Observation data). One of its distinguishing features is its spatial underpinning by which the accounts are derived from underlying maps based on high spatial resolution remote sensing data (e.g. of ecosystem extent, condition and of ecosystem services). This spatial nature in combination with the fact that accounts are by their nature scalable, allows them to be used in wider range of applications beyond national use, such as land-use planning. The spatial data in accounts can be recompiled to address local ecosystem services values to land managers not typically identified at aggregate national accounting level. This has the potential to addresses part of the IPBES Valuation Assessment agenda to make visible nature's contributions to local communities.

The number of countries undertaking NCA is increasing. As of June 2020, 92 countries have compiled SEEA accounts, compared to around 49 in 2006 when the first baseline was assessed. The number of countries that has compiled some form of ecosystem accounts lies around 30 (Hein et al, Science 2020), with around 10-15 additional countries that are currently experimenting.

Accounts can be an important vehicle for mainstreaming of biodiversity and ecosystems. A lesson learnt is that to enhance policy uptake accounts need to be developed in close collaboration with the intended users and stakeholders. This is the point of departure in current implementation projects.

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[22] Sub-indicator (b) 15.9.1.b: Number of countries that have integrated biodiversity values into national accounting and reporting systems, defined as implementation of the System of Environmental-Economic Accounting (SEEA). https://unstats.un.org/sdgs/metadata/?Text=&Goal=15&Target=

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