4. Natural capital accounting: Growing experience and testing the 10 living principles to make it fit for policy

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Summary

The *2nd Policy Forum on Natural Capital Accounting for Better Decision Making* brought together a range of different professions and organizations to share experiences, discuss issues and identify opportunities for applying natural capital accounting to the Sustainable Development Goals (SDGs). In this paper, we made a systematic analysis of the contributions to the 2nd Policy Forum – the presentations, discussions and written papers – as well as linking these to the 1st Policy Forum and other relevant documents. From this growing body of experience, we extracted important lessons for future progress and key opportunities for the application of natural capital accounting to the SDGs both as a whole as well as individually (e.g. those related to water, climate change, terrestrial and sustainable consumption and production). As part of the analysis we tested the "10 living principles" that emerged from the 1st Policy Forum. From this we conclude that: (1) the natural capital accounting community of practice is growing both in terms of the amount of emerging evidence and the number of people and organizations involved; (2) natural capital accounts can help achieve the SDGs as well as help assess trade-offs between individual SDGs; (3) the 10 living principles are useful and based on the experience to date we need to emphasize that continuous effort is required to apply them, particularly for mainstreaming and collaboration, and; (4) the Policy Forum can continue to play an important role in the development and application of natural capital accounting via the sharing of experiences, highlighting examples of the connection to policy, providing guidance and focusing attention on areas in need of future research.

4.1 Introduction

On 22 and 23 November 2017, the *2nd Policy Forum on Natural Capital Accounting for Better Decision Making* (hereafter the 2nd Policy Forum) was held in The Hague, The Netherlands. The meeting was summarized in Bass (2018) and our paper builds on this summary as well as the papers by Ruijs et al. (2018) and Brown et al. (2018) by synthesizing the key lessons and opportunities that emerged from the 2nd Policy Forum, encompassing reflections on all of the Forum inputs – presentations, discussions and written papers. Our paper then goes on to link to the "10 living principles to make natural capital accounting fit for policy" that emerged from the 1st Policy Forum (Bass et al. 2017).

Over 60 participants from 20 countries came together for the 2nd Policy Forum to share experiences and learn from one another about how natural capital accounting, as described in the System of Environmental-Economic Accounting (SEEA) (United Nations et al. 2014a), can be used for decision making in government and business. Based on the 2nd Policy Forum, it is clear that more countries are undertaking construction of natural capital accounts (NCAs) (see

UNCEEA 2017), many supported by the World Bank WAVES partnership or United Nations Statistics Division (UNSD). Notwithstanding this, integrating these accounts into government policy and business planning remains a challenging task requiring specific attention.

The 2nd Policy Forum brought together users and producers of NCAs with a focus on how the accounts can feed into the national policies and business decisions aimed at achieving the Sustainable Development Goals (SDGs) of the *2030 Agenda for Sustainable Development,* which aims to end poverty, protect the planet, and ensure prosperity for all. In all, 17 goals and 169 sub-targets are defined under the *2030 Agenda* aimed at improving the lives and future prospects of everyone, everywhere. Recognition that the goals related to people, planet and profits are interlinked and indivisible has resulted in the need for an integrated agenda. At the 2nd Policy Forum, countries and agencies discussed how natural capital accounting can provide an integrated approach to the design, implementation and review of actions to achieve the SDGs. Further discussion occurred around how NCAs can be used to advance individual SDGs as well as to assess and exploit synergies and trade-offs between SDGs. The 2nd Policy Forum contained sessions on poverty, green growth, the role of business, life on land, government processes and assessing trade-offs.

In this Chapter, we summarize the main lessons that arose from the 2nd Policy Forum and analyze the content from contributions to build on the lessons from the 1st Policy Forum, specifically to what extent the material shared aligns with the 10 living principles for making natural capital accounting policy-relevant (Bass et al. 2017), and the implications of this for achieving the SDGs and related aims. The material examined includes both the presentations made at the 2nd Policy Forum as well as the written material contributed via the 2nd Policy Forum webpage,[39] not all of which were presented during the Forum. Two papers directly built on work presented in the 1st Policy Forum: one on accounting for biodiversity (King et al. 2018) and the other on accounting for State of the Environment reporting (Summers et al. 2018). A third on ecosystem accounting in Australia (Keith et al. 2018) made observations directly on the alignment of their work with the 10 living principles.

In the remainder of this chapter we examine the SDGs and how natural capital accounting can help monitor progress and potentially demonstrate that they have been achieved (Section 4.2 – also see Ruijs et al. 2018). In Section 4.3, we examine specific instances of uses of NCAs in decision making related to biodiversity, carbon and forests (which are related SDGs), while in Section 4.4 we evaluate the material shared relative to the 10 living principles. Section 4.5 outlines a number of general conclusions and the next steps.

4.2 Applying natural capital accounting to attain the SDGs

The core objectives of the *2030 Agenda for Sustainable Development*[40] are the 17 Sustainable Development Goals (SDGs) and 169 sub-targets including, for example, ending poverty and hunger, improving health and education, combating climate change, environmental sustainability and inclusiveness (United Nations 2015; Fig. 4.1). Currently, individual countries are in the process of translating their ambitions with respect to the SDGs into integrated policy

[39] See https://www.wavespartnership.org/en/forum-natural-capital-accounting-better-policy

[40] The 2030 Agenda, adopted at the United Nations Sustainable Development Summit in September 2015, aims to transform our world for the better. It is a broad sustainability action plan agreed upon by all UN member states, with the objective of leaving no one behind and focusing on the poverty-development-environment nexus. See https://sustainabledevelopment.un.org/post2015/transformingourworld

agendas. To achieve this ambition, individual countries need to create awareness, set specific national targets, design and implement policies, and monitor progress towards the goals.

Figure 4.1 The 17 Sustainable Development Goals (SDGs)

Source: www.sustainabledevelopment.un.org

Addressing the SDGs collectively requires an integrated policy framework built on the inter-linkages between the economy, the environment and society (e.g. triple-bottom line accounting). Such integrated approaches to information using accounting were evident in several contributions to the 2nd Policy Forum, including by Australia, Botswana, Costa Rica, Guatemala, Indonesia, the Netherlands, Peru and the United Kingdom. Included here were examples of natural capital accounting measuring changes in the physical stock and value of natural capital, the physical and monetary benefits received by people and, importantly, linking these to the System of National Accounting (SNA) (European Commission et al. 2009). Such accounting provides analysts and policymakers with the information needed to obtain insights into the contribution of natural capital to wealth creation, employment, wellbeing, and poverty reduction. In short, NCAs explicitly contribute to economic development and the SDGs (Bann 2016).

Monitoring status and trends of SDGs

Currently, within the SDG process, most countries focus on monitoring the status and trends of the SDG indicators (Ruijs et al. 2018), with more than 200 indicators of performance developed internationally (United Nations 2017). An analysis of the how NCAs can support these SDG indicators shows that the economic and material flow accounts provide the data necessary for a broad range of SDGs[41] (also see Table 4.1 in Ruijs et al. 2018). For example, the energy supply-and-use table can generate the indicators related to energy intensity and percentage of renewable energy; the water supply-and-use tables and asset accounts are used for estimating the percentage of water resources used; and the air emission accounts serve as basis for estimating carbon emissions per unit of value added. Using natural capital accounts instead of

[41] See https://unstats.un.org/unsd/envaccounting/ceea/.

other data sources to generate the SDG indicators results in coherence of the data within the accounting framework. In this, income, industries, inputs and outputs to production, assets classes, etc. are defined and used consistently. This ensures coherence between the indicators, enabling comparisons between different areas (e.g. water, land, energy) and between countries. The compilation of accounts by independent statistical agencies, rather than policy agencies, increases the trustworthiness of the information.

Despite the SDGs being in their infancy (i.e. established in 2015), evidence presented at the 2nd Policy Forum shows that more and more countries are using or planning to use natural capital accounting for monitoring progress towards the SDGs. For example, Costa Rica monitors progress of their sustainability objectives using their water and energy accounts (Alvarado Quesada 2017) and Botswana's water accounts provide evidence for their water governance and water planning policies related to SDG 6 (Itshekeng 2017). Zambia is putting more emphasis on SDGs related to poverty, hunger, inequality and infrastructure (SDGs 1, 2, 10 and 9) than on SDGs related to natural capital protection, but the NCAs can still play a role in monitoring progress (Lungu 2017). Additionally, there is evidence that the NCAs are being incorporated into the policy agenda, albeit indirectly, through food security, climate change and water-related policies that support objectives related to hunger and poverty.

Analyzing SDG interlinkages and SDG policies

Presentations from the 2nd Policy Forum showed that NCAs are being used for analyzing policies related to the SDGs. For example, Ruijs et al. (2018) outlined some of the many analytical methods available that can use NCAs to assess SDG policies. One such approach, network analysis, is used to analyze interlinkages between individual SDG indicators and to learn whether synergies between the SDGs can create win-win opportunities or can assess the trade-offs between them. Examples of such network analysis for SDGs are presented by Griggs et al. (2017), Zhou and Moinuddin (2017), Niestroy (2016) and, Nilsson et al. (2016a, b). Other approaches involve applying NCAs to estimate material footprints, climate footprints or water footprints (Edens et al. 2015), and in scenario analysis, cost-benefit analysis, equilibrium modelling or input-output modelling (United Nations et al. 2017).

So far, these approaches are not often applied to policy analysis. However, the 2nd Policy Forum showed that such analysis is now occurring, for example using general equilibrium models like the Integrated Economic-Environmental Modelling (IEEM) (see Banerjee et al. 2017). To date, IEEM has been used in Guatemala, Costa Rica, Colombia and Rwanda to show the economic and environmental effects of different policy scenarios (Banerjee 2017). Using the IEEM approach can show the relationship between a wide range of ecosystem services provided by the available stock of natural capital, as well as decisions about its use in production and consumption by government. In the last year, the environmental modules of the IEEM have improved, allowing greater analysis of ecosystem services. Additionally, IEEM can also be used to undertake analysis of land use and land cover changes (as in Guatemala); post-conflict deforestation trajectories (as in Colombia); and green-growth scenarios (as in Rwanda) (Banerjee 2017). The IEEM uses a social accounting matrix, the set-up of which corresponds to the arrangement of the supply-and-use tables of the national accounts and NCAs.

Due to the linkage between NCAs and economic modelling, the effects of policy changes on a broad range of SDGs can be monitored. Such linkages can also be used for analyzing the effects of policies on genuine savings.

Other modelling approaches have also been used in natural capital accounting. For example, Indonesia used a system-dynamics model to analyze the consequences of its national development plan (Medrilzam 2017). This example included the agricultural, mining and forestry industries and directly integrated information from the accounts to assess the relationships between natural capital, poverty, economic growth and the population. Lastly, the effects of policies on biodiversity, greenhouse gas emissions and land use were also included in the modelling process. In another modelling approach from New Zealand, energy and greenhouse gas emission accounts were developed and used in a computable general equilibrium model (Webb 2018). In this, the initial accounts developed the necessary information for the model, so the statistical office devoted additional resources to generate the level of detail necessary for the analysis.

Institutional conditions supporting natural capital accounting and the SDGs

There is growing attention devoted to creating the institutional conditions to enable NCAs to be used in the SDG policy-making process. For example, in Zambia, government agencies, research institutions and international organizations are working together to match the supply of natural capital accounting data to the demand for policy-ready results.[42] Similarly, Bertrand et al. (2018) and Naidu and Vardon (2018) note the importance of aligning policy demand with research interests and account production when initiating natural capital accounting processes.

The experiences from the 2nd Policy Forum show that use of natural capital accounting in the SDG policy process is just beginning and that future progress will require coordination and cooperation between parties that may not traditionally work together. To enable this progression to occur, initiatives aimed at improving skills and competencies in the analysis and applications of the accounts to government and business decision making processes are needed – something that is of equal importance to both high and low-income countries.

The broad range of experiences to date shows that natural capital accounting processes can be helpful for building institutional coordination around the SDGs. Such institutional coordination leads to additional understanding of the processes and strengthens statistical skills (including quality checks of primary data), all of which have direct links with the national accounts providing positive outcomes for policy makers. Moreover, NCAs could underpin SDG processes as a multi-purpose information system supporting an integrated policy framework. The development of joint information and policy frameworks facilitates the need for collaboration outside of the usual departmental boundaries. For this to happen, it is crucial that activities to implement natural capital accounting are not limited to the production of accounts and the related data sources and methods, but are also extended to cover analysis and policy applications. A key constraint to achieving such an outcome requires changes in governance that enable commitment to the process. Such a process creates shared ownership, institutional cooperation, and the desire and ability to use effectively the accounts once they are produced (i.e. institutional and personal ownership).

4.3 Applying natural capital accounting to biodiversity, carbon and forests

The SDGs cover a large range of aspects of national development as well as environmental and economic management, for which the application of natural capital accounting is described in

[42] https://www.wavespartnership.org/en/zambia-joins-waves-identifies-priority-accounts-during-stakeholder-consultation-0

Section 4.2 (above). Several countries and researchers have chosen to focus on particular SDGs, rather than the entire 17 SDGs. This section looks at the application of natural capital accounting to three specific SDGs: biodiversity, carbon or forests.

Biodiversity

Several contributions to the 2nd Policy Forum examined how biodiversity was included in NCAs and how this approach could be used in decision making in Australia (Keith et al. 2018; Summers et al. 2018), Peru (Portela et al. 2018), Uganda (King et al. 2018) and South Africa (Driver 2017). Encouragingly, the work in Uganda built on work presented at the 1st Policy Forum linking natural capital accounting to the Aichi Biodiversity Targets (Vardon et al. 2017b). King et al. (2018) extend the approach, mapping SDG 15 and the Aichi Targets to the NCAs under the System of Environmental-Economic Accounting (SEEA) (United Nations et al. 2014a, b). The examples from Australia, Peru, South Africa and Uganda illustrate that using accounting practices for biodiversity at the species and ecosystem level is possible and can also be useful for decisions relating to land management and endangered species protection.

Table 4.1 shows that for these four country examples, ecosystem extent accounts are the most common type of biodiversity account produced. These accounts can usually be produced with existing information on land cover obtained from remotely sensed data. Ecosystem extent accounts can be combined with other information to account for additional biodiversity values, for example, to judge the representativeness of the protected area network and to assess the supply of ecosystem services from different ecosystems. For example, two case studies presented at the 2nd Policy Forum featured work on the ecosystem service of water supply (Keith et al. 2018 and Driver 2017).

Management of threatened or charismatic (iconic) species can also be investigated via natural capital accounting. In this regard, different types of species accounts have been prepared, for example, two focusing on threatened species, one on species richness (total number of species occurring in a particular place), and another on charismatic species (Table 4.1). These types of accounts help to identify habitat for such species, from which decisions about extensions to the protected area network or for investments in the restoration of particular habitat types, can be made.

For international reporting, both SDG target 15.9 and Aichi Target 2 identify natural capital accounting as a means of ensuring biodiversity is considered in mainstream economic decision making. While the experiences to date in this regard are limited to a few countries, the examples presented here show promise for broader application in the future.

Table 4.1 Production and use of biodiversity accounts contributed to the 2nd Policy Forum

Country and region	Accounts produced	Policy issues addressed	Source
Australia – Central Highlands	Ecosystem extent Ecosystem condition Threatened species Ecosystem services	Expansion of protected area network Threatened species conservation Water management	1
Australia – Australian Capital Territory	Ecosystem extent Ecosystem condition Threatened species	State of the Environment and sustainability reporting	2
Peru – San Martin	Ecosystem extent Ecosystem condition Species richness Ecosystem services	National development planning Regional water resource management	3
South Africa – KwaZulu-Natal	Ecosystem extent	National and regional land use planning Expansion of protected area network Water management Investment in ecosystem restoration	4, 5
Uganda	Ecosystem extent Species accounts	National development planning National biodiversity conservation strategy	6

Source: 1). Keith et al. (2018); 2). Summers et al. (2018); 3). Portela et al. (2018); 4). Driver (2017); 5). Driver et al. (2015), and; 6). King et al. (2018).

Carbon and forests

Several carbon and forest accounts have been produced (e.g. Australia, Costa Rica, Guatemala Indonesia and the UK) and these have applied to a range of policy issues (Table 4.2). The forest accounts have been aimed at addressing land use planning and sustainable forestry (e.g. wood extraction is not greater than the regenerative capacity of forests). The examples from Guatemala (Banerjee et al. 2017), Costa Rica (Alvarado Quesada 2017) and Indonesia (Medrilzam and Adinia 2017) show that forest and carbon accounts are being used to protect, restore and promote sustainable use of forests, halt and reverse land degradation, and halt biodiversity loss. While these accounts provide essential information to monitor deforestation, they also link economic activity to national contributions to reduce greenhouse gas emissions. Similarly, forest, carbon and ecosystem services accounts have helped the Victorian government in Australia to compare the benefits from timber concessions with those from conserving forests (Keith et al. 2018; part 2 of this volume).

Furthermore, the forest accounts produced in the UK helped Forest Enterprise England to better quantify the ecosystem services provided by the forests they manage, and to better monitor changes in forest condition. These accounts also provided the Forest Enterprise board with better insights into the difference between the financial and social values of their forests (Winram 2017).

Table 4.2 Production and use of carbon and forest accounts contributed to the 2nd Policy Forum

Country and region	Accounts produced	Policy issues addressed	Source
Australia – Central Highlands	Forest extent Carbon stock Ecosystem services from forests (timber provisioning, water provisioning, carbon sequestration, and recreation)	Expansion of protected area network Sustainability of forest industry Water management Options for climate mitigation	1
Costa Rica	Forest extent Supply and use of timber	Forest management Deforestation policies Analysis of Payment for Environmental Services	2
Guatemala	Forest extent Supply and use of timber	Deforestation policies	3
Indonesia	In preparation	Options for climate mitigation	4
United Kingdom	Forest extent Supply and use of timber Ecosystem services from forests (timber provisioning, water provisioning, carbon sequestration, and recreation)	Forest management Monitoring changes in forest extent and condition	5

Sources: 1). Keith et al. (2018); 2). Alvarado Quesada (2017); 3). Banerjee et al. (2017); 4). Medrilzam and Adinia (2017), and; 5). Winram (2017).

4.4 Assessment of experience against the 10 living principles

The 10 living principles for making NCAs fit for policy emerged from the 1st Policy Forum (Table 4.3) (Bass et al. 2017). The aim of creating these principles was to have them tested and reviewed over time, hence the inclusion of the word "living." Testing is important to see if these principles reflect the key issues identified by those producing or using natural capital accounts. Review is also important to see whether producers and users of the accounts use these principles in the development of natural capital accounting projects and, if not, understand why and update them as necessary.

Table 4.3 The 10 living principles for NCAs fit-for-policy purpose, grouped across four main areas (after Bass et al. 2017)

Comprehensive:	
1. *Inclusive*	Acknowledging the diverse stakeholders concerned with decisions affecting natural capital, responding to their information demands, respecting different notions of value, and using appropriate means of engagement.
2. *Collaborative*	Linking the producers of NCAs, the users of NCAs for policy analysis and the policy makers using the NCAs results, and building their mutual understanding, trust, and ability to work together.
3. *Holistic*	Adopting a comprehensive, multi/interdisciplinary approach to the economic and environmental dimensions of natural capital and to their complex links with policy and practice.
Purposeful:	
4. *Decision-centred*	Providing relevant and timely information for indicator development and policy analysis to improve and implement decisions with implications for natural capital.
5. *Demand-led*	Providing information actually demanded or needed by decision makers at specific levels.
Trustworthy:	
6. *Transparent and open*	Enabling and encouraging public access and use of NCAs, with clear communication of the results and their interpretation including limitations of the data sources, methods, and/or coverage.
7. *Credible*	Compiling, assessing, and streamlining data from all available sources, and deploying objective and consistent science and methodologies.
Mainstreamed:	
8. *Enduring*	With adequate, predictable resourcing over time; continuous application and availability; and building increasingly rich time series of data.
9. *Continuously improving*	Learning focused, networked across practitioners and users, testing new approaches, and evolving systems to better manage uncertainty, embrace innovation, and take advantage of emerging opportunities.
10. *Embedded*	NCA production and use becoming part of the machinery of government and business, building capacity, improving institutional integration for sustainable development, and incorporating NCAs use in procedures and decision-support mechanisms.

The presentations and written papers of the 2nd Policy Forum provide an opportunity to see how the 10 living principles produced from the 1st Policy Forum reflect current practice, as well as an opportunity to review and the update the principles as necessary. The following paragraphs examine the 10 principles grouped into the four main areas: comprehensiveness, purposeful, trustworthy and mainstreamed (Table 4.3).

Comprehensiveness

- **Living principle 1: Inclusive** – The experience of the 2nd Policy Forum showed that construction of NCAs is *inclusive* and as such, compel all parties involved to look beyond the factors usually considered by each in isolation. This inclusive nature makes NCAs suitable for the SDGs and the development of an inclusive policy framework. The use of NCAs in forest management in the UK (Winram 2017), Australia (Keith et al. 2018), Peru

(Portela et al. 2018) and Guatemala (Banerjee et al. 2017) shows that accounting helps to identify a range of services and beneficiaries of forests not always considered. Thus, the accounts present a more inclusive story about beneficiaries and go beyond simple binary choices (e.g. forest for timber harvesting or for nature reserve). The inclusive nature of the accounts also shows that those directly earning income from natural resources are not the only or main beneficiaries of the resource. The natural capital accounting being developed in Zambia is designed to support policies that aim to include all people and groups. Many of the contributions to the 2nd Policy Forum, as well as the papers in this report (e.g. Naidu and Vardon 2018; Bertrand et al. 2018; Webb 2018; Keith et al. 2018; and Summers et al. 2018), illustrate inclusive measures, specifically relating to consultation with multiple stakeholders.

- **Living principle 2: Collaborative** – Experience from Brazil, Botswana, Rwanda, Uganda, Indonesia, the Pacific, the Netherlands and Australia also shows that the natural capital accounting process is *collaborative*. Multiple agencies, ministries and environmental stakeholders, both nationally and internationally, are involved in producing the accounts. To achieve the SDGs, collaboration is key and actively supported by the custodian agencies of the individual SDGs. It is widely acknowledged that data for monitoring the SDGs has to come from many agencies. In this respect, the SDGs and natural capital accounting processes support each other. However, there are examples where accounts for a single resource, or SDGs for a single issue, are produced or analyzed in silos, only including the agencies that have collaborated in the past. As such, while accounts can play a role in stimulating *collaboration*, it remains a point of contention in some countries or agencies.

- **Living principle 3: Holistic** – The SDGs and natural capital accounting can be *holistic*. For example, the SDGs cover a broad range of policy fields, including all three pillars of sustainability. Natural capital accounting in principle is holistic, looking at natural capital from a broader perspective and in particular the different benefits and beneficiaries that can be gained from natural capital. The risk, however, is that both the SDGs and natural capital accounting are treated in silos. In some cases, natural resource conservation is not among the major policy priorities and, as such, demand for NCAs may be reduced (e.g. in Zambia). Conversely, the experiences in South Africa, Guatemala and Uganda show that ecosystem or forest accounts provide very relevant information and allow insights into the causes and solutions for poverty, hunger and inequality, demonstrating that policy use of NCAs can be broader than just conserving natural resources.

Purposefulness

- **Living principle 4: Decision-centered** – Decision-centered production of accounts has begun. Actual and potential uses of the accounts are very broad as described by Smith (2014), United Nations et al. (2017), Vardon et al. (2017a), and in this volume. For most countries, the concept of natural capital accounting is still relatively new and thus the production of NCAs is in its infancy. Therefore, clear examples have taken time to emerge. The 1st and 2nd Policy Fora have successfully facilitated the advancement and production of case studies and publicly brought experiences together. In some cases, the potential use of the accounts outside of government has occurred in the first instance, which is a key lesson that has emerged. For example, in Guatemala, it was the university that started constructing and using natural capital accounts. Once the Government appreciated the usefulness of national capital accounting, it began incorporating the production and use of accounts into government systems and processes. Examples where the accounts feed into

decision-making processes for developing and implementing policy responses have also been observed. For example, Brazilian water policies use the information from the water accounts in their decision making, while Costa Rica uses policy analyses based on natural capital accounting to inform energy and water policies. In Australia, the accounts for the Central Highlands could be used in decisions about timber harvesting and expanding the protected areas network. Finally, Rwanda wants to use natural capital accounting for land use planning and to feed into financial investment decisions.

- **Living principle 5: Demand-led** – Several examples of demand-led accounting exist where governments have demanded one or more accounts to support specific needs. In Botswana, it was the President who demanded natural capital accounting to support his sustainability ambitions for the country. In Australia, the Commissioner for Sustainability and the Environment of the Australian Capital Territory asked for NCAs to be undertaken for State of the Environment reporting. In the UK, Forests England asked for the creation of forest accounts, to learn more about changes in, and uses of, its assets nationally. Finally, in Uganda, the Government asked for biodiversity accounts in order to be able to report against the Aichi biodiversity conservation targets. In terms of the policy cycle and natural capital accounting (Vardon et al. 2016), these examples focus mainly on monitoring and review but also move into issue identification by informing or creating awareness in civil society.

Trustworthy

- **Living principle 6: Transparent and open** – Transparency and openness are key to natural capital accounting. For example, all-natural capital accounts produced by governments and others are published and made available to the public. This openness is also important for the SDGs and reporting against such goals. For example, the statistical process led by UNSD promotes a transparent and open SDG monitoring process. The NCAs prepared for businesses are also transparent and open with, public consultations on the sector guides of the Natural Capital Protocol, for example.[43] Many businesses use the NCAs to demonstrate to the public what they do to operate more sustainably. It is possible that some businesses, especially those for whom it is difficult, if not impossible, to prevent negative impacts, will not make their accounts public, and instead use them for internal decision-making processes.

- **Living principle 7: Credible** – The use of international frameworks for NCAs ensures that the accounts produced are *credible*. While governments use the SEEA as the framework for natural capital accounting, many businesses use the Natural Capital Protocol. The development of these frameworks using international processes, and their subsequent testing and use by countries and business, means that the accounts produced are *credible* and defensible. The ongoing development of each of these frameworks, in particular their extensions into ecosystem accounting, will help to maintain and extend the credibility of these accounting approaches in the future.

  Credible accounts are also insured by data quality assessment processes promoted by international organizations[44] and used by government statistical agencies. There are also

[43] E.g. the forest products sector guide to the Natural Capital protocol, https://collaborase.com/forest-products

[44] E.g. International Monetary Fund data quality reference site, http://dsbb.imf.org/pages/dqrs/dqaf.aspx

academic processes. The case from Australia of accounting for the Central Highlands is interesting because there were several different publications for distinct groups of stakeholders: a policy brief for policy makers, a popular article for the general public, a scientific article to assure scientific soundness, and a full report containing all details of the data sources and methods. Another interesting example comes from Brazil, where a range of infographics were published to explain in clear and graphically appealing terms what the Government learned from their water accounts. Both examples illustrate how the presentation of the NCAs can help to build credibility.

A necessary but sometimes missing step in establishing credibility is explaining how NCAs are used in policy models. For example, countries like Indonesia, Costa Rica, Guatemala and Rwanda have used accounts in models for prospective assessments of policy instruments, and even though these models have been extensively explained in a technical way and the results are useful for policy analysis, for outsiders these models can look like black boxes. It is thus important that the modellers and policy developers using the models are capable of explaining in general terms how their models function and what the results mean for policy. Perceptions that the models based on NCAs are black boxes will threaten their credibility.

Mainstreamed

- **Living principle 8: Enduring** – Within government, *enduring* production of accounts has occurred in Australia, the Netherlands, the UK and other high-income countries. Ongoing resourcing for account production has occurred in Botswana, Colombia, Costa Rica and Mexico, with each of these countries producing accounts without financial or technical support from donors. Planning for account production in other countries (e.g. Guatemala, Indonesia, the Philippines, Rwanda and South Africa) is beyond the support provided by international agencies (e.g. United Nations and World Bank). In all of these countries, account production is firmly established within their statistical agencies, central banks and/or ministries, resulting in high-level support from government agencies that are users of the accounts.

  In several cases, account production and analysis were a one-off event, as seen in the work of the Australian National University in Central Highlands of Victoria, Australia (Keith et al. 2018) and the UNEP-WCMC in Uganda (King et al. 2018). One reason for this may be that such programs support a one-off decision, like in the case of Australia or some of the business initiatives presented by Brown et al. (2018). Alternatively, the accounts may have been produced as a pilot to illustrate the potential uses of the accounts to government and other stakeholders (like in the case of Uganda).

- **Living principle 9: Continuously improving** – It is still too early to see whether countries that have only recently begun producing NCAs are *continuously improving* them. Where the accounts have been produced for extended periods of time (e.g. Australia, the Netherlands and the UK) as well as some of the more recent examples (e.g. Botswana, Colombia and Costa Rica), we have observed that natural capital accounting involves learning-by-doing. To illustrate this point, the first accounts take more time to produce than subsequent ones, as account production becomes faster and better. Account producers also learn more about the system, find new data sources or additional ones become available, or innovative ways to use existing data are developed (e.g. translating remote sensing or administrative data into accounts). Moreover, participation in expert

international fora, such as the London Group on Environmental Accounting,[45] and the 1st and 2nd Policy For a, give participants new skills and experiences to improve their accounts. All of the countries that participated in the 1st and 2nd Policy Fora are enthusiastic about continued production of accounts.

- **Living principle 10: Embedded** – Embedding account production and use within government remains a challenge. While there is generally good progress with account production and systems are in place for collecting and accessing data as well as assessing and assuring its quality, *embedding* the NCAs in policy analysis (i.e. development and/or implementation), requires more effort and commitment. A key issue is that, for accounts to be used, they first need to be created and then they have to be understood and appreciated in terms of the benefits to policy and analysis. Since governments have historically functioned without NCAs, many agencies do not see the need for them. In some cases, government agencies do not want them as the information they reveal may challenge the status quo. Thus, some policy agencies may be a barrier to the production of accounts. Hence, in many cases the first accounts tend to be produced independently by a statistical agency or university. This supply-led approach is likely to continue to be necessary until NCAs are considered fundamental, like the national economic accounts.

  The next barrier to production and use of accounts is improving the understanding of such accounts within the government policy and management agencies. Without such understanding, it is almost certain that these accounts will not be used or embedded within government processes or in the analyses from outside on which they rely. We have learned from the application of the IEEM model in Costa Rica that embedding requires a proper translation of the results in a way that is attractive and understandable by policymakers. This highlights the need for clear communication as well as the importance of providing a range of case studies that illustrate how NCAs can be used for particular analyses, models and evaluations in government processes – the primary objective of the Policy Forum.

4.5 Conclusions

Based on the material shared and discussed at the 2nd Policy Forum, combined with further analysis of the Forum material and other related studies (see above), it is clear that natural capital accounting is gaining traction in policy circles globally. Based on our review of the 2nd Policy Forum, we identified four key conclusions:

1. The natural capital accounting community of practice is growing in terms of (i) the amount examples where NCAs are being successfully used; and (ii) the number of people and organizations actively undertaking NCAs.
2. Producing NCAs can help countries to attain the SDGs as well as assess and evaluate trade-offs between different SDGS.
3. The 10 living principles developed from the 1st Policy Forum are supported by experiences. However, we need to emphasize the continuous effort required to apply them, particularly for mainstreaming and improved collaboration.
4. The Policy Forum is an important platform in the development and application of natural capital accounting through (i) the sharing of experience; (ii) highlighting examples of the connection to policy; (iii) providing guidance; and (iv) focusing attention on areas in need of future research.

[45] https://unstats.un.org/unsd/envaccounting/londongroup/

The number of countries, organizations and people involved in the Policy Forum has increased significantly. The 2nd Policy Forum was co-hosted by the United Nations Statistics Division which, as well as increasing the technical expertise of the production and use of NCAs within the Forum, also attracted additional countries, namely Brazil, Mexico, South Africa, India and China. The connection to business was also strengthened between the 1st and 2nd Policy Fora. This growth in participation is a clear sign that linking NCAs to decision making is of great interest to governments, business, academics and non-government organizations.

Importantly, the 2nd Policy Forum revealed that a range of natural capital accounting work related to the SDGs was occurring. This work began by using the natural capital accounts as an information platform for producing the indicators related to the SDG targets. Additionally, a range of countries including Australia, Costa Rica, Guatemala, the Netherlands and the UK have shown that NCAs can provide information that is important for formulating and implementing policies needed to achieve the SDGs. This work is exciting and promising but still in its infancy.

One year on and the 10 living principles have stood up to their first round of examination. While they have not yet been used explicitly upfront to design natural capital accounting programs, retrospective analysis shows they underpin the accounting process. Going forward, greater emphasis on mainstreaming of the principles is needed to help secure the resources needed for ongoing production of NCAs and also for establishing the networks and understanding needed within governments and business for their effective use in analyses and decision-making processes.

While it is clear that much work remains to make the link between NCAs to decision making common place, examples are emerging that will aid future progress. The 1st and 2nd Policy Fora highlighted many of these examples, as well as the need for this work to continue. It is of great importance that the producers and users of NCAs continue to regularly come together, to share experiences, highlight achievements, reflect on challenges, distil lessons, and identify opportunities. Going forward, guidelines for applying NCAs to the SDGs could be produced, while the application of natural capital accounting to standard government and business processes, such as budgeting and investment decisions, should be explored.

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