

Natural capital accounting for better policy

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Abstract A growing number of countries is setting up natural capital accounts (NCA) based on the system of environmental-economic accounting (SEEA); however, actually using them for better policy making turns out to be complex. This paper synthesises lessons on the institutional mainstreaming of the SEEA and its use in improving policy decisions affecting natural capital. It draws on discussions held at two Policy Forums organised by the World Bank Wealth Accounting and Valuation of Ecosystem Services program and the United Nations Statistical Division. Practical examples of how the SEEA helps to improve policy making are explored. Emerging from the Forums were ten principles for making NCA fit for policy. These principles promote a comprehensive NCA organisation, a purposeful use of accounts, trustworthy methods and institutionalisation of NCA mechanisms in government. To put these principles into practice, six strategies are outlined: (1) assure credibility of the accounts; (2) align supply and demand for NCA; (3) assure high level support for NCA; (4) encourage cooperation between institutions so NCA and policy are mutually constructive; (5) provide evidence that natural capital is economically important and; (6) assure policy-relevant communication of NCA results.

Keywords Biodiversity · Ecosystem services · Environmental policy · Environment mainstreaming · Natural capital accounting · Natural capital · SDGs · SEEA

INTRODUCTION

A wide variety of government decisions—on topics as diverse as poverty reduction, investment, economic growth

and environmental management—are increasingly sensitive to natural resource values and associated scarcities. But they are not always well informed about these values. One major advance was the publication of the System of Environmental-Economic Accounting Central Framework (SEEA CF) (United Nations et al. 2014a, b). Since then, many countries have made progress in constructing Natural Capital Accounts (NCA) based on the SEEA CF, some with international assistance.¹ Understanding and use of NCA is now at a stage where it can inform policy decisions for the better, and on a systematic basis. Yet, there is still only a limited (albeit growing) number of examples of actual use of the accounts to design, improve and review policy (Recuero Virto et al. 2018). Systematically integrating the SEEA CF accounts into government processes and policy preparation, monitoring and review is an arduous task that requires a dedicated and enduring strategy. If NCA remains within the realms of statistical agencies and central banks without proving its added value to policy processes, and without proper embedding in national government institutions, there is a risk that policy-makers will lose interest in NCA and reduce budgets for its set-up and maintenance. How to prevent this from happening is a topic deserving more attention.

This paper offers an initial synthesis of achievements and lessons from the use and institutionalisation of NCA in actual policy-making processes of governments. It presents a number of institutional and organisational strategies that draw on experiences by a group of countries that have recently started using the SEEA CF to extend their national

¹ Throughout the text, by NCA we refer to natural capital accounts that are set up according to the SEEA CF, and linked to the System of National Accounts. This contrasts with other natural capital information systems that may also be used for including natural capital considerations in public or private decision-making.

accounts with natural capital accounts. Ultimately, the aim of this paper is to help both NCA developers and policy-makers from all countries to learn about how better natural capital information from the SEEA CF can enrich policy analyses, feed into practical policy decisions and become embedded in national government institutions. To achieve this, the paper presents lessons from recent applications of NCA, most of which were brought to light during the two forums on ‘NCA for Better Policy’, organised in The Hague in November 2016 and 2017 by the World Bank WAVES Partnership, the UN Statistics Division, PBL Netherlands Environmental Assessment Agency and the Dutch Ministry of Foreign Affairs (see Vardon et al. 2017a; Ruijs and Vardon 2018).² During these forums, NCA developers (statisticians and accountants) and NCA users (analysts and policy-makers) gathered to discuss a rich set of case studies, ranging from low- to high-income countries and those with long or short experience of NCA, learning how NCA information can be mainstreamed to help make better policy decisions. The 2016 forum was the first time that users and producers of natural capital accounts had gathered internationally to discuss how NCA could feed into policy processes. The second forum, in 2017, focussed on the question of how NCA can help achieve the Sustainable Development Goals (SDGs).

Since the appearance of the Millennium Ecosystem Assessment (Millennium Ecosystem Assessment 2005), a broad range of papers has appeared, discussing how ecosystem services, natural capital or biodiversity information can be measured and mainstreamed in policy-making (see e.g. Ekins et al. 2003; Daily et al. 2011; McKenzie et al. 2014; Guerry et al. 2015; Costanza et al. 2017; Ruijs and van Egmond 2017). Numerous tools have been developed that can use this information to help policy-makers better assess the consequences of their policies for natural capital (see e.g. Banerjee et al. 2016; Sharp et al. 2018 or see oppla.eu). These papers variously address ecosystem services or natural capital in general, or are one-off analyses of specific problems, or offer new methods of how natural capital information can be included in policy analysis. Only some mention of the SEEA CF as a source of information on natural capital is made, despite international agreement to adopt the SEEA CF as an international statistical standard (Ekins et al. 2003; Schaefer et al. 2015). Moreover, most papers do not focus on how natural capital information should be structured and mainstreamed—i.e. consistently linked to other (macro-)economic data and institutionally embedded and sustained in national government institutions. Guerry et al. (2015) and Recuero Virto et al. (2018), conclude that the use of the SEEA CF in

government decision-making is still more an exception than the rule. The current paper is one of the first to present real-life examples and lessons of how national authorities use NCA, based on the SEEA CF, to feed into environmental and resource policy processes. One of the novelties of this paper is that it deduces effective strategies and principles to institutionally embed the SEEA CF into national government institutions and to mainstream it into government planning and budget cycles and procedures. Much of the SEEA CF literature focusses instead on technical aspects of setting up natural capital accounts (see e.g. Edens and Hein 2013; Hein et al. 2015). But, in most cases, those who set up the accounts are not those who use the resulting information. It is not straightforward to incorporate the accounts into actual policy-making processes, such that national authorities actually draw on the new information to better account for natural capital.

Despite the differences between the SEEA CF and other natural capital or ecosystem services approaches, it is possible to draw lessons about institutionalising the use of NCA in government policies from the literature on achievements and barriers to mainstreaming biodiversity in decision-making (see e.g. Lucas et al. 2014; PBL 2014; OECD 2015; IIED and UNEP-WCMC 2017), on mainstreaming ecosystem services in (public) project evaluation (see e.g. TEEB 2010; Guerry et al. 2015; Ruijs and van Egmond 2017) and on mainstreaming the monitoring of trends and status of ecosystem services (see e.g. Maes et al. 2012). These streams of literature also focus on the integration of natural capital information in development strategies, policies and budgets (Lucas et al. 2014; PBL 2014). They show that mainstreaming should be considered as a process to engage policy-makers, civil society and the private sector, and to demonstrate the long-term benefits of protecting natural capital (OECD 2015; Ruijs and van Egmond 2017).

The difference between this literature and literature on policy use of the SEEA CF lies in the way data are managed in NCA and in the institutions necessary to bring together and sustain the supply and demand for NCA information. NCA provides a uniform, coherent and integrated platform that informs cross-sectoral and macro-economic policy agendas and enables international comparisons of sustainability, for example. Moreover, it provides policy-makers with data in the same format as the System of National Accounts, which is a format they are used to, and—among other things—provides the high-profile indicator GDP. The link to the System of National Accounts enables important connections between the health of the economy and that of natural capital to be analysed. NCA benefits from developments in monitoring and valuation of biodiversity and ecosystem services in terms of new and coherent ways to collect data and value

² See <https://www.wavespartnership.org/en/forum-natural-capital-accounting-better-policy>.

natural capital, and may in turn support these same developments by offering a system that can serve systematic data and policy analysis. Yet, despite these opportunities, in many countries the institutions working on the national accounts do not collect the natural capital statistics, and so aligning supply and demand of natural capital accounts is not straightforward. This paper brings together much of the experience on this topic.

The next section of this paper discusses the potentials of NCA to integrate natural capital considerations in policy-making processes. “[NCA-policy achievements to date](#)” section presents the policy uses and achievements of NCA to date and the institutional challenges the countries have overcome. “[Principles and strategies to make NCA fit for policy](#)” section offers ten principles and six key strategies, drawing from the lessons learned in this paper.

NATURAL CAPITAL ACCOUNTING

What is natural capital accounting and how did it develop?

Natural capital accounting has grown out of traditional accounting, which has a history stretching back hundreds of years (Gleeson-White 2012). There are two distinct branches of NCA: one related to business; and the other to national accounting, which has given us the iconic measure of GDP. The branch of national accounting has yielded an internationally adopted framework, the SEEA (United Nations et al. 2014a, b), while the business accounting branch of NCA has produced several frameworks, notably the Natural Capital Protocol (NCP) (Natural Capital Coalition 2016). Both the SEEA and the NCP provide a standardised system (or set of rules) for recording information related to the (in)actions of people and the environment. The SEEA does this for the entire economy, while the NCP is for a particular business.

This paper focuses on the use of NCA for public policy. That said, the main emphasis in standard national accounting is on flows of goods and services traded by people and expressed in monetary terms. NCA extends the national accounts to include the extraction of materials such as timber, fish, water and minerals, the services provided by the environment and used by the economy, the return of pollutants, and the extent and condition of the environment (Fig. 1). It also includes measures of the stock of natural resources (the assets). This information is recorded in both physical and monetary terms. For example, the volume of water used would be recorded in litres and money, while the quality of water returned to the environment would be measured using metrics like pH, electrical conductivity or amount of dissolved oxygen.

To date, more than 50 countries have produced NCA at a national level, generally using existing data sources and methods to populate the accounts. In addition, the SEEA has continued to develop conceptually—notably with the SEEA Experimental Ecosystem Accounting (United Nations et al. 2014b) covering ecosystem services as well as the condition, degradation and depletion of ecosystems.

Potentials to integrate NCA in the policy process

The promise of how NCA can aid policy-making has many facets, and there are good examples of most of them. NCA can help to answer a broad range of natural resources and environment policy questions during all phases of the policy cycle (Smith 2014; Ten Brink et al. 2016; Vardon et al. 2016a). Figure 2 depicts a notional policy cycle covering the major stages of identifying problems, and developing, implementing, monitoring and reviewing policy responses. The cyclical process is often iterative, and the entry points for NCA can be in any part of the cycle (Vardon et al. 2016a). The figure also shows the types of information that can be obtained with the help of NCA during each stage.

Natural capital accounts can be used for forward-looking analyses in conjunction with other tools, for example to inform strategic planning processes (e.g. National Development Plans, Land Use Master Plans, Green Growth Strategies) and to design the policy measures needed to implement the plan, such as taxes and regulations. They can also be used by themselves in backward-looking assessments and monitoring, such as environmental-economic macro-indicators, environmental protection or restoration expenditure reviews and environmental or sustainable development monitoring (e.g. State of the Environment Reports, SDG monitoring reports and reporting obligations related to carbon emissions, biodiversity or water quality). Accounts can be disaggregated to provide information for production by economic sector or by region, or to address allocation issues. The special value of natural capital accounts—as opposed to basic environmental and sectoral statistics (e.g. for energy, water, forest statistics)—is that the accounts better allow for analysing the linkages between environmental and economic systems, and lend themselves to be integrated into economic models and other economic tools.

But it is not always necessary to have the full suite of natural capital accounts available for them to be useful. In conjunction with economic data, physical natural capital accounts can be used in cost-efficiency analyses, or in analysing changes in resource use due to taxes. Monetary natural capital accounts can be used in cost-benefit analyses. Accounts do not necessarily have to be available at a national level, but can also be prepared at regional or local

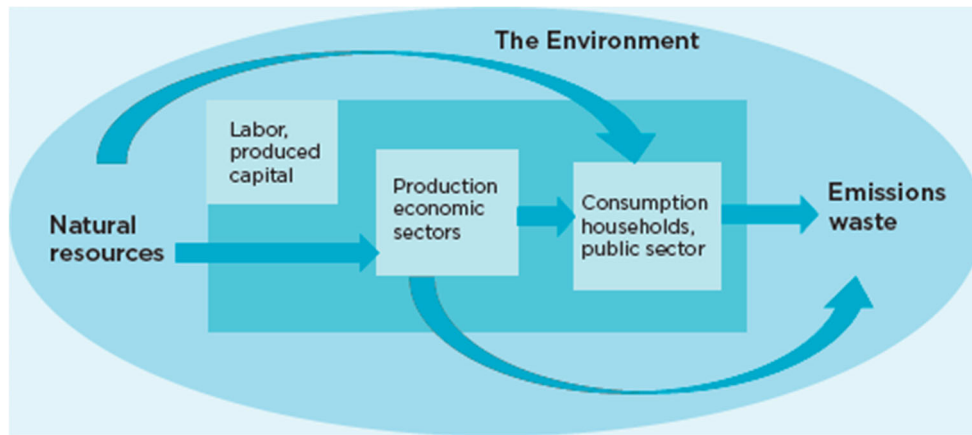


Fig. 1 Schematic of the environmental-economic system depicted by NCA. *Source* Bass et al. (2017)

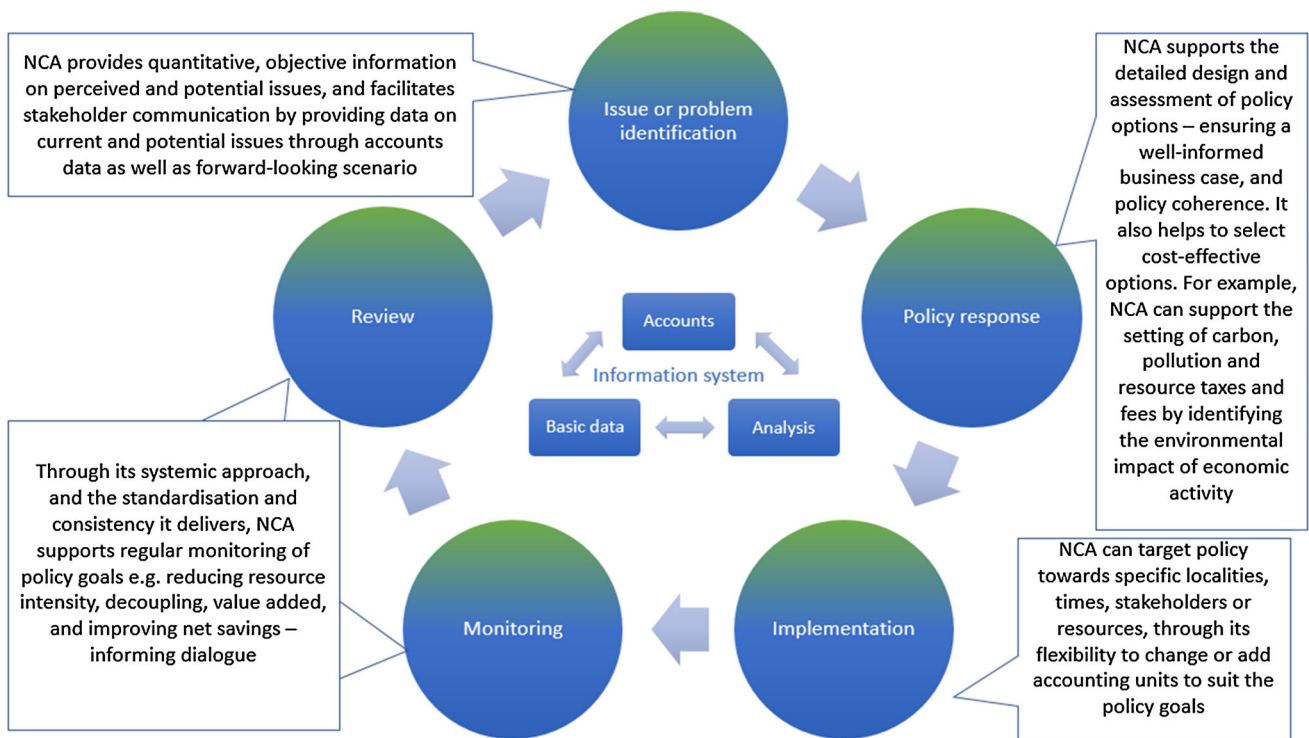


Fig. 2 The policy cycle and associated NCA uses. *Source* Adapted from Vardon et al. (2016a)

levels. The types of question asked by decision-makers are diverse, and the uses of NCA are similarly broad: Table 1 illustrates these across the different stages of the nominal policy cycle shown in Fig. 2.

NCA-POLICY ACHIEVEMENTS TO DATE

Policy uses of NCA

A wide range of examples of the policy uses of NCA to date were discussed at the two international policy forums

on NCA for Better Policy.³ Table 2 presents these examples and notes the stages of the policy cycle for which NCA was used.

These examples show that policy applications of NCA are diverse. Water and forestry are two of the major themes for which the accounts have been used so far. Water accounts have been used for identifying linkages between particular economic activities and water use, for preparing catchment management plans and for informing revision of

³ See Vardon et al. (2017a), Ruijs and Vardon (2018), and <https://www.wavespartnership.org/en/forum-natural-capital-accounting-better-policy>.

Table 1 Uses of NCA for policy. *Source* Bass et al. (2017)

Policy use	Decision-makers' questions	Information system (data, accounts and analytical tools)	Types of answer provided by NCA
Identification of issues	-How are we doing? What has changed, and how does that link to changes in the economy and other factors? -Given assumptions about domestic and international development, how will we fare in the future?	-Accounts data and derived indicators, simple projections, -Input–output analysis, environmental-economic models, scenario modelling, spatial analysis, footprint analysis	-Interpretations from the data on past and present state of natural capital -Scenarios for future development of economy and environment
Policy response	-If we want to change the current state or projected future state, what can we do? -Who benefits from changes in policy? -Who bears the costs of benefits in policy?	-Accounts data and derived indicators, Input–output analysis, Computable General Equilibrium Modelling, environmental–economic models, scenario modelling, cost–benefit analysis, integrated assessment	-Economic and environment effects of restrictions on scenarios to achieve policy targets - <i>Ex ante</i> assessment of the effects of policies on the economy and environment
Policy implementation	-How can we target the policy response to get the most improvement for least cost? -Which activities should be done first? -What price should be put on natural resources?	-Accounts data, derived indicators, environmental-economic modelling, spatial analysis, industry analysis, cost–benefit analysis, business case	-Detailed assessment of all pros and cons of the policy interventions
Policy monitoring	-Are the policies making progress towards goals and targets?	-Accounts data and derived indicators	- <i>Ex durante</i> assessment of policy progress and evaluation of the need to adjust policy instruments
Policy review	-How can we make the existing policy more effective to achieve the goals and targets? -Are there any unintended consequences of the policy response? -Do we need different policy responses?	-Accounts data and derived indicators, econometric modelling	- <i>Ex post</i> policy evaluation of effectiveness and efficiency of policy instruments

water fees and cost recovery (Nagy et al. 2017; Oosterhuis 2017; Pule and Galegane 2017; Romero et al. 2017a). Forest accounts inform forest policies (Banerjee et al. 2017b; Castaneda et al. 2017; Uwera et al. 2017) or serve as basis for sustainable forest management plans (Forest Enterprise England 2017).

In a number of cases, NCA has been instrumental in identifying or clarifying issues or problems. These include the identification of wildlife using water in possible competition with other water users in Botswana (Pule and Galegane 2017), in the possibly unsustainable harvest of fuelwood in Guatemala (Banerjee et al. 2017b) and in the assessment of forestry concessions in the Australia (Keith et al. 2017). Colombia has used the accounts to assess the damages of the El Niño climate phenomenon in 2015 and to quantify the environmental benefits to be gained by Colombia in a peacetime scenario (Romero et al. 2017b). Beyond individual sectors, many countries are increasingly

using NCA to monitor progress towards sustainable development and other multi-sector and holistic objectives—such as to show links between natural resources and poverty, green growth and carbon management potentials (Medrilzam 2017; Steinbach 2017; Schenau 2017; Webb 2018). The SDG agenda is still young, and so development of SDG policies based on NCA is still limited, but there are potentially many interesting applications (see Ruijs and Vardon 2018).

The examples in Table 2 show that NCA has tended to be used in particular stages of the policy cycle. The Dutch energy policies are one of the few cases in which the accounts have played a role throughout all stages (Ruijs 2017): they are used to identify the scope of the energy problem, to formulate new policy measures, to evaluate whether objectives will be reached, to monitor progress of the energy policies and to review and make necessary adjustments. But the examples also reveal that NCA use

Table 2 Examples of NCA uses by theme and stage in policy cycle

	Issue identification	Response	Implementation	Monitoring	Analysis and review
Energy	Netherlands ¹	Netherlands ¹	Netherlands ¹	Netherlands ¹	Netherlands ¹
	Botswana ²	Costa Rica ³		Costa Rica ⁴	Costa Rica ⁴
Water	Netherlands ⁵	Botswana ⁶	Botswana ⁶	Netherlands ⁵	Guatemala ⁷
	Botswana ⁶	Guatemala ⁷	Colombia ¹⁰	Botswana ⁶	Colombia ¹⁰
	Guatemala ⁷		Australia ¹¹	Colombia ¹⁰	Rwanda ¹²
	Peru ⁸		Rwanda ¹²	Rwanda ¹²	
	Brazil ⁹			Brazil ⁹	
Forests and land	Guatemala ⁷	Guatemala ⁷	Guatemala ⁷	Colombia ¹⁰	Guatemala ^{7, 14}
	UK ¹³	Rwanda ¹²	Colombia ¹⁰	Rwanda ⁸	Rwanda ¹²
			Rwanda ¹²	UK ¹³	
Minerals	Botswana ²			Rwanda ¹²	Phillippines ¹⁵
Biodiversity and ecosystems	Uganda ¹⁶	Australia ¹⁹	Aichi targets ²⁰	Phillippines ¹⁵	
	Peru ⁸	South Africa ¹⁷	Australia ¹⁹	Aichi targets ²⁰	Australia ¹⁹
	South Africa ¹⁷			EU ²¹	
	Mexico ¹⁸				
SDGs and sustainability	UK ²²			UK ²²	Guatemala ^{7, 25}
	Netherlands ²³			Sweden ²⁴	UK ²²
				Netherlands ²³	Sweden ²⁴
Green growth/economy	Guatemala ⁷	Indonesia ²⁶		Colombia ¹⁰	Guatemala ⁷
		Rwanda ²⁷		Sweden ²⁴	
				Netherlands ²⁸	
Climate change		Indonesia ²⁹	Indonesia ²⁹	Indonesia ²⁹	Guatemala ⁷
		New Zealand ³⁰			Colombia ¹⁰
					New Zealand ³⁰
State of environment reporting	Australia ³¹			Australia ³²	Australia ³²

1. Ruijs (2017), 2. Republic of Botswana (2016), 3. Vargas-Campos (2016), 4. Rivera et al. (2017), 5. Oosterhuis (2017), 6. Pule & Galegane (2017), 7. Castaneda et al. (2017), 8. Portela et al. (2018), 9. National Water Agency (2018), 10. Romero et al. (2017a), 11. Nagy et al. (2017), 12. Uwera et al. (2017), 13. Forest Enterprise England (2017), 14. Banerjee et al. (2017b), 15. Gervacio (2017), 16. King et al. (2018), 17. Driver et al. (2015), 18. Schipper et al. (2017), 19. Keith et al. (2017), 20. Vardon et al. (2017c), 21. Ledoux & Wejchert (2017), 22. Barter (2017), 23. Statistics Netherlands (2018), 24. Steinbach (2017), 25. Banerjee et al. (2017a), 26. Medrilzam (2017), 27. Uwera (2017), 28. Schenau (2017), 29. Medrilzam & Adinia (2017), 30. Webb (2018), 31. Summers et al. (2018), 32. Smith et al. (2017)

has been most straightforward for the two stages of problem identification and monitoring, e.g. for monitoring the progress of the sustainable energy targets in Costa Rica (Gutiérrez-Espeleta 2017; Rivera et al. 2017), progress towards the SDGs (Ruijs and Vardon 2018) or business use of ecosystem services (Ledoux and Wejchert 2017; Brown et al. 2018). The UK and the Netherlands also use NCA to identify factors affecting green growth and to monitor sustainability (Barter 2017; Schenau 2017), while the Australian Capital Territory has used NCA for State of Environment reporting (Smith et al. 2017; Summers et al. 2018).

More complex NCA handling is necessary for investigating and designing new policies or setting targets. In most cases, examples of NCA being used to design policy come from countries that have been producing NCA for a

long time (for examples from the United Kingdom, Sweden and the Netherlands see: Barter 2017; Oosterhuis 2017; Ruijs 2017; Schenau 2017 and; Steinbach 2017). These countries have had the time to develop and mainstream policy-relevant models and indicators as well as the institutional structures through which policy messages from NCA analyses can reach policy-makers (Ruijs and Van der Esch 2017; see also 4.2). That said, many countries that have only recently begun NCA programmes are already using the accounts to develop policy responses. Examples include Indonesian use of NCA in a systems-dynamic model for setting its Intended Nationally Determined Contributions (INDC) (Medrilzam and Adinia 2017), Guatemalan use of NCA for setting forest policies (Castaneda et al. 2017), Colombian use of NCA to update water use fees (Romero et al. 2017a) and experiences in

Botswana of using NCA for developing the national water strategy and for catchment management plans (Pule and Galegane 2017). In the cases of Guatemala, Costa Rica and Rwanda, this has been supported by the use of the Integrated Economic-Environmental Modelling (IEEM) framework (see Banerjee et al. 2017a, b).

Institutionalisation of NCA into policy processes

The users of NCA have been: (1) agencies of government responsible for particular natural resources or geographical areas; (2) government bodies with responsibilities for broad or cross-sectoral strategic direction, planning or budgeting; (3) research and analytical institutions, within or outside government; and (4) businesses and civil society. While many countries and institutions have begun accounting, relatively few have effectively and firmly integrated NCA into their formal policy processes. A key achievement of those countries with long-standing NCA programmes—the Netherlands (Ruijs and Van der Esch 2017), Sweden (Steinbach 2017) and the United Kingdom (Barter 2017)—is that they have managed to build enduring links between the NCA user and producer communities. In these three countries, NCA producers have a legal mandate for their work, with formal administrative arrangements, and high-level requests for information on particular issues. There is also a clear delineation of roles, with NCA production being undertaken in national statistical offices, and policy departments receiving and using the information. In the case of the United Kingdom, the independent Natural Capital Committee reviews the accounts and makes recommendations to central government, with the Treasury being obliged to respond.

One of the main achievements in many of the countries newer to NCA, is that the NCA process is designed specifically with cross-sectoral and strategic level government planning in mind, striving to link the accounts to diverse users including Ministries of Finance, Planning, Development and others. Deliberate attempts are made to build an enduring link between NCA users and producers and to generate policy momentum (Gervacio 2017; Gutiérrez-Espeleta 2017). Topical issues like green growth, the SDGs and climate change with potential impacts over the whole spectrum of the economy have also excited interest in the finance and development authorities, where it is clear that the policy and NCA development processes may support one another. Despite the challenges in building these relations, many countries have already had notable achievements, leading to institutionalisation of accounting within the statistical offices (e.g. in Colombia), ministries (e.g. in Rwanda) or central banks (e.g. in Costa Rica). NCA is being used in development planning in Colombia, Guatemala, Indonesia and the Philippines and

its role is being recognised at the highest levels of government in Botswana and Costa Rica.

Many of the examples reveal underlying lessons about the catalytic role of NCA: developing NCA enhances communication and coherence between actors, ministries and agencies that had been working on separate (if inter-linked) areas. In developing the accounts, much emphasis has been put on pulling together and consolidating scattered data, making more efficient use of existing data, and allowing data gaps and deficiencies to be identified and addressed. In some countries, this has had the effect of breaking down silos—although the process has been time-consuming, with formal agreements usually needing to be made to share data and resources. In the WAVES-supported countries, a key achievement has been that NCA has become a key ‘navigational’ instrument for the kinds of adaptive, multi-issue policy-making and institution-linking which are needed for sustainable development today (Burnett 2017).

PRINCIPLES AND STRATEGIES TO MAKE NCA FIT FOR POLICY

Many positive achievements are evident in the cases we have reviewed. To move forward—to scale up and speed up NCA’s fruitful application to policy, as well as policy openness to NCA—the two NCA-Policy Forum meetings developed and began to validate ten tentative principles for NCA that is fit for policy purpose (Table 3). Experience in both policy forum meetings suggests that countries recognise the importance of these principles.

To put these principles into practice, we outline six institutional strategies that have helped the countries discussed in this paper to ensure NCA is fit for policy purpose. Some strategies are operational and relatively easy to organise. Others are more deeply-rooted challenges that are not specific to NCA, but to government more generally. Some refer to the development of the accounts, others to the institutional organisation to integrate NCA information in policy processes.

Strategy 1. Assure NCA credibility and trustworthiness For NCA information to be used, it must be credible and trustworthy. We learn from most countries that NCA are accepted politically—as being reliable and trustworthy—even though that may take time and effort especially when they refer to new and, for some people, complex or contentious concepts. The international standardisation of NCA in the SEEA CF 2012 has helped to assure data reliability (Vardon et al. 2017b). In some countries, such as we see in the Netherlands (Oosterhuis et al. 2016), a stronger environment of trust was established by institutionally separating the task of building the accounts from

Table 3 The 10 principles for NCAs fit-for-policy purpose

Comprehensive	
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
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
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	
Decision-centred	Providing relevant and timely information for indicator development and policy analysis to improve and implement decisions with implications for natural capital
Demand-led	Providing information actually demanded or needed by decision makers at specific levels
Trustworthy	
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
Credible	Compiling, assessing, and streamlining data from all available sources, and deploying objective and consistent science and methodologies
Mainstreamed	
Enduring	With adequate, predictable resourcing over time; continuous application and availability; and building increasingly rich time series of data
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
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 task of using the accounts for policy analysis. On the other hand, in other countries it was not essential to allocate these tasks to separate institutions from the beginning (Castaneda et al. 2017; Medrilzam and Adinia 2017; Pule and Galegane 2017; Romero et al. 2017b).

Strategy 2. Align NCA supply and demand to arrive at agreed NCA purposes For NCA to be mainstreamed in policy-making, the supply of, and demand for, NCA results

should be aligned. Burnett (2017) asserts that accounts should be designed for policy relevance, not simply to meet accounting standards. Related to this, experience reveals that NCA results are fitter for policy purpose if the scale and level of detail of the accounts correspond with the questions at stake, the feasible policy options, and the decision-making level—and are available when decisions need to be made. For example, the Philippines deliberately chose to develop water accounts for a specific river basin (Laguna de Bay Technical Working Group 2016). In contrast, the limited use of water accounts for analysing water policy options in the Netherlands is due to a mismatch between the type and level of decision-making on one hand, and the type and level of information available from the accounts and related models on the other (Oosterhuis 2017).

Strategy 3. Assure high-level support To mainstream NCA in government processes, it is important to create and sustain high-level political understanding and support for NCA. Those countries in which WAVES and UNSD are partnering with powerful central ministries, such as finance and planning, and are backed by high-level officials or ministers, are more successful in setting up accounts and realising their added value than countries where this high-level support is lacking (Vardon et al. 2016b). In Botswana, Costa Rica and Mozambique, countries with presidents or ministers who profile themselves as sustainability champions, it proves to be easier to mainstream NCA in policy processes.

Strategy 4. Encourage cooperation between institutions to make NCA and policy mutually constructive A system in which NCA is fully integrated in decision-making processes is characterised by cooperation, data-sharing and mutual trust. In many countries, the reality is still very different from this ideal, which takes time and continuous effort to achieve. Countries experienced in NCA show that they have improved collaboration by creating multi-disciplinary technical working groups and multi-agency NCA-policy steering committees that have forged effective ways of working (Vardon et al. 2016b; Barter 2017; Ruijs and Van der Esch 2017; Steinbach 2017). The examples show that many countries have much of the necessary data available, but that the data are dispersed between many organisations and businesses which may not be willing to share it (Ledoux and Wejchert 2017). Almost all countries have had to learn how to transcend the difficulties of cross-sectoral and multi-disciplinary cooperation. A starting point in many countries was to find joint interests that create entry points for cooperation. The Indonesian experience (Medrilzam and Adinia 2017) showed that a streamlined NCA system could be achieved for tracking indicators and reporting on international and national targets, such as SDGs, Strategic Environmental

Assessment (SEA), Government Financial Statistics (GFS) and INDCs. While this feature of NCA is a challenge to create, it is also a great opportunity since effective data availability, data-sharing and collaboration are key for effective evidence-based policy. Moreover, once these challenges are overcome, a positive spin-off of doing NCA is that it helps cross-sectoral coordination and collaboration among policy fields (for example, in the Philippines and Botswana).

Strategy 5. Provide evidence that natural capital is economically important Long-term sustainability and natural capital issues may not be highest on the everyday policy agenda. However, due to its close links with the System of National Accounts, NCA provides information that clarifies the economic importance of natural capital, helping to make the case for better evidence-based policy for sectors that are dependent on natural capital, but also politically weak. As many countries developing NCA admit, there are still too many government institutions at a stage where social, environmental and economic objectives are not treated in an integrated way, but as separate topics that may be conflicting (see also Raworth et al. 2014). If not immediately, the process of working together to set up and mainstream NCA into the System of National Accounts helps these institutions to integrate sustainability into public policy-making. National implementation of the 2030 Agenda for Sustainable Development, which encourages and requires an ‘integrated and indivisible approach’ to diverse issues may, in this respect, accelerate the useful application of NCA.

Strategy 6. Assure policy-relevant interpretation and communication Clear and policy-focussed communication of NCA results is key to getting NCA results used in the policy process. Increasingly, NCA is being presented through infographics, maps and charts to make complex results digestible. Examples include green growth indicators in the Netherlands (Schenau 2017), energy use in Costa Rica (Rivera et al. 2017), the peace dividend in Colombia (Romero et al. 2017b), water use in Brazil (National Water Agency 2018) or the social benefits of England’s forests (Forest Enterprise England 2017), all demonstrating the power of graphic messages in conveying the results and their implications. Interpretation and case-making is just as important. For example, in a context where the English public had reacted strongly against a government proposal to sell off public forests, the notion of a ‘forest value’ as ‘sale price’ was not attractive; instead Forest England’s accounts chose to present forest values as savings in health costs, reflecting forests’ high recreation benefits. A dedicated communication strategy—elaborating what messages, to whom and how they are delivered—can help to ensure messages effectively influence their target audiences.

CONCLUSIONS

The diverse policy relevance of NCA is demonstrated in all of the cases reviewed here. All countries have concluded that the institutional arrangements needed to translate NCA in policy, as discussed in this paper, are important. The cases discussed here provide a range of lessons about how this can be done. To move forward—to scale up and speed up NCA’s fruitful application to policy, as well as policy openness to NCA—the two NCA-Policy Forum meetings created insights and a sense of urgency among the participants to further implement the strategies, such as to develop NCA that is fit for policy purpose. Investment and continuous effort will be required to apply them all, so that NCA becomes fully effective, efficient and embedded in a country’s decision-making.

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