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INTEGRATED LANDSCAPE MANAGEMENT AND NATURAL CAPITAL ACCOUNTING: WORKING TOGETHER FOR SUSTAINABLE DEVELOPMENT

Background document for the 4th Policy Forum on
Natural Capital Accounting for Better Policy being held
in Kampala Uganda, 18-19 November 2019

Johan Meijer, Ezra Berkhout, Chloe Hill and Michael Vardon

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INTEGRATED LANDSCAPE MANAGEMENT AND NATURAL CAPITAL ACCOUNTING: WORKING TOGETHER FOR SUSTAINABLE DEVELOPMENT

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Corresponding authors

Johan.Meijer@pbl.nl

Michael.Vardon@anu.edu.au

Authors

Johan Meijer, Ezra Berkhout (PBL), Chloe Hill (Altus Impact) and Michael Vardon (Australian National University)

Supervisor

Olav-Jan van Gerwen (PBL)

Ultimate responsibility

PBL Netherlands Environmental Assessment Agency

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MAIN FINDINGS

Introduction

Integrated Landscape Management (ILM) and Natural Capital Accounting (NCA) are relatively new frameworks that have each synthesized a broad range of theory and practice in order to achieve, among other things, sustainable development. This paper is to explore these approaches and their links and provide background material for discussion at the 4th Policy Forum on Natural Capital Accounting for Better Policy, being held in Kampala Uganda, 18-19 November 2019.

Managing global challenges at the landscape level

The ILM framework is an alternative to conventional sectoral management of natural resources. The landscape level is often the best scale for managing interactions, synergies, trade-offs for the various aspects of natural resource management. In particular, ILM can improve inclusiveness and participatory nature of the planning process at national and subnational levels. To have effective ILM at any level, credible, accepted, accurate and up-to-date information is required to identify key issues, current and future trade-offs, develop and implement effective ways to maximize benefits and minimize damage to the economy and the environment through improved landscape planning and decision making.

NCA providing standardized information on natural resource use

NCA is an information platform that systematically organizes economic and environmental information that has been standardized via the System of Environmental-Economic Accounting (SEEA), which among other things expands the coverage of the System of National Accounts (SNA), that gives the GDP (gross domestic product) metric. In particular, NCA assesses the depletion and degradation of natural resources as well as the contributions of ecosystem services to the economy and human wellbeing more generally.

Can we bring these concepts and communities closer together?

This report explores the options and potential benefits of bringing ILM and NCA closer together. In this it is acknowledged that both ILM and NCA are relatively new, and as such there has been very little interaction until now. However, while the integration of ILM in NCA, and vice versa, has only occurred to very limited extent until now, much more is seems possible.

Benefits of connecting ILM and NCA

Drawing on examples from a range of countries, spanning low to high income countries, as well as expert opinions, we concluded that NCA can contribute to different aspects of ILM in line with the general decision-making cycle:

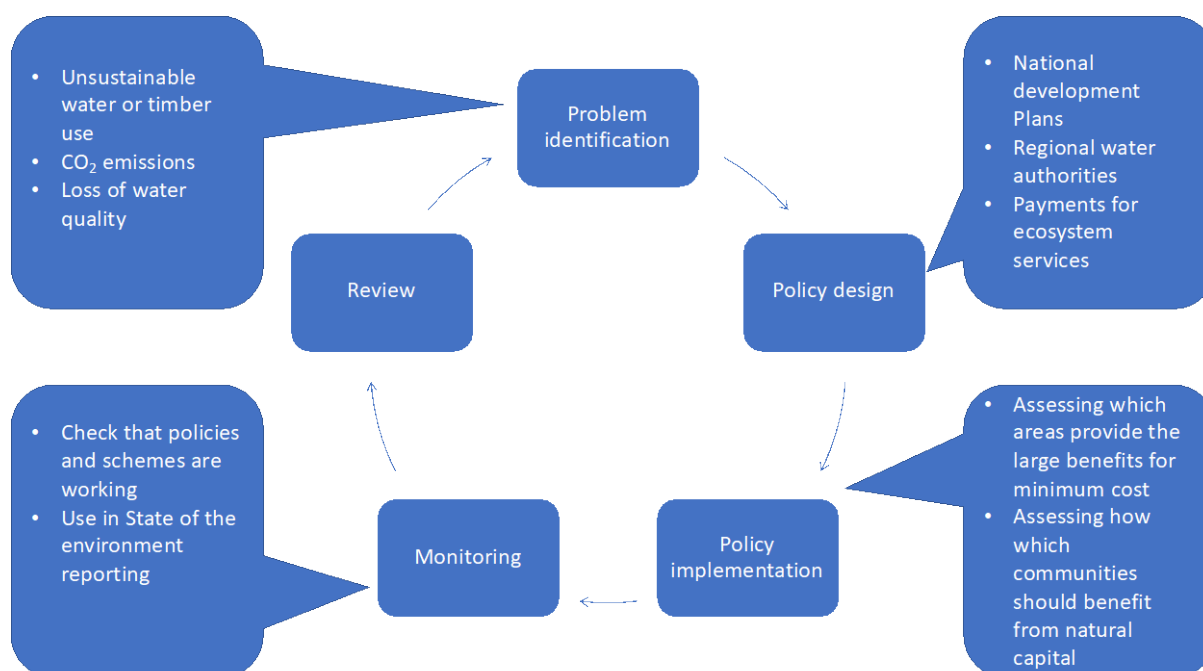
Problem identification – maps of NCA information are particularly useful for communicating to decision makers where there are problems. The accounts, when coupled with appropriate modelling and analysis, were also useful for predicting where problems might be in the future.

Policy design – NCA can be used in modelling and scenario analysis to show existing trade-offs. Such information can then feed into new policy instruments, such as payments for ecosystem services and restoration, or for encouraging the finance sector to internalize the broader benefits and risks to investments in major infrastructure projects

Policy implementation – NCA can be used to identify particular places and communities that could benefit from a more efficient targeting of existing policies. This could be the poorest communities, or the areas either at most risk of degradation or that would deliver the greatest benefits from the least investment (i.e. the low hanging fruit).

Monitoring and review – is consistently identified as the key benefit of NCA realized to date. Having integrated environmental and economic data presented regularly and consistently would be a significant advance and valuable to national governments, regional authorities, local landowners and financiers alike. The regular production of the accounts leads to improvements in data availability and quality as well as increasing the trust in the accounts at all levels (local to national).

Figure: How NCA can inform integrated landscape management in the policy cycle



A range of valuable insights and lessons for integrating ILM and NCA are summarized in the table below, which looks at: the processes and governance; data sources and methods; challenges in construction; funding and finance; communication, and; potential and challenges in the policy cycle and decision making

Going forward

To achieve more effective integration of ILM and NCA several things are needed:

- Greater understanding and engagement between the two professional communities as well as the decision makers involved in land management
- Developing and sharing of examples of successful applications of NCA to ILM
- Better raw data for NCA
- Trust in both information and the decision-making processes of ILM and NCA

As part of going forward, some practical issues and questions should be considered by the ILM and NCA communities. This would include:

Data coverage and quality mismatch – Data access and data quality are recurring issues for both ILM and NCA. What are the key datasets needed for ILM and NCA?

Boundary selection – The management areas of ILM seldom directly match the data output area available. How best to select the policy boundaries and then to match these to the data available?

Landscape-level decision-making criteria – what approaches, like ‘carrying capacity’, ‘catchment planning’ and ‘social value’, are paramount for ILM and how can NCA best serve them?

Institutional reform – how can ILM and NCA together shift institutional set-ups from silos to synergies, from overly-centralized to usefully decentralized?

Inclusion – can NCA and ILM work together to reduce the risk of entrenching top-down approaches? How can better landscape level data put power in local stakeholders hands to ensure ILM is equitable?

Pilots – what scope for pilot joint ILM/NCA work that would address the above?

A key outcome of the 4th Policy Forum on Natural Capital Accounting for Policy would be to come to a common understanding of these issues and questions. This in itself would be a significant achievement. If progress towards answering these issues and questions can also be made via the meeting of the two communities and some pilot joint projects identified, then we will be a step closer to achieving sustainable development.

Based on the discussions at the 4th Policy Forum and comments on this draft, this document will be updated and published in a final form. For this, comments on this draft are welcome and can be directed to the lead author, Johan Meijer: Johan.Meijer@pbl.nl

Table: Summary of insights and lessons for integrating ILM and NCA in decision making

Category	ILM perspective	NCA perspective	Reinforcing ILM & NCA
Process and governance	<ul style="list-style-type: none"> (1) Complexity (and inclusivity) increases with the number of stakeholders, (2) Small areas, not always aligning with jurisdictional boundaries (3) managing multi-stakeholder relations is quite a challenge. 	<ul style="list-style-type: none"> (1) Need a process to bring the different data holders together. (2) Need formal arrangements for sharing data (3) High-level agreements between agencies on data sharing and data use (4) Account users need to be involved in account design and construction 	<ul style="list-style-type: none"> (1) Senior representative of key stakeholders in the ILM and NCA communities need to be brought together as early as possible (2) Need to form a high-level strategic body as well as technical groups that cover both construction and use of accounts (3) Production of the first accounts is not the end point
Data and methods (information needed)	<ul style="list-style-type: none"> (1) ILM can be seen as a process that needs to be fed by data and analysis (2) A more standardized approach to ILM data needs would likely assist with implementation (3) Require data and methods that focus on multifunctional uses (like mosaics, agroforestry) 	<ul style="list-style-type: none"> (1) Data is scattered between different agencies (2) Data is usually missing (3) Models and assumptions are needed to the absence of complete data (4) Regional and local data are essential to ILM (5) Need GIS technology and expertise to produce ILM usable accounts 	<ul style="list-style-type: none"> (1) Need to accurately represent the quality of data in information products. (2) Need have data quality assessment processes in place (3) Need to continuously improve data sources for the accounts
Challenges in construction (or challenges in implementation)	<ul style="list-style-type: none"> (1) Challenge of integrating data originating from various administrative classifications (e.g. districts, watersheds, economic growth zones) (2) Often lacking socioeconomic data compared remote sensing derived data (3) dealing with spillover effect beyond landscape boundaries 	<ul style="list-style-type: none"> (1) Breaking down national level information to match regional or local area (2) Scaling up local data to match regional or national data (3) Spatially representing information creates issues with confidentiality (4) Gaining an understanding of ILM and decision-making terminology 	<ul style="list-style-type: none"> (1) Defining boundaries for NCA that align with ILM regions (2) Gaining common understanding of terminology between ILM and NCA communities (3) Need to produce NCA quickly to demonstrate usefulness to ILM community
Funding and finance	<ul style="list-style-type: none"> (1) So far finance has been mentioned by a limited number of governments and international organizations and NGOs 	<ul style="list-style-type: none"> (1) So far finance has been mentioned by a limited number of governments and international organizations and NGOs 	<ul style="list-style-type: none"> (1) Funding needs to be found for pilot studies of applying NCA to ILM (2) Funding by national governments and international agencies is important initially.

Category	ILM perspective	NCA perspective	Reinforcing ILM & NCA
	<p>(2) Challenge of connecting large investors and funds to small landscape interventions</p> <p>(3) Strong link to sustainable finance and corporate social responsible activities</p>		<p>(3) Funding can come from a range a international, national and local stakeholders and joint funding may increase commitment to on-going production and use of accounts</p>
Communication	<p>(1) ILM is not a well know term but the general concepts of it are recognized and understood by land managers</p> <p>(2) the concept is strong in illustrating interactions, either between activities in landscapes, or tradeoffs in SDGs</p>	<p>(1) NCA is not well understood and need to address this early in account production</p> <p>(2) Need a plan for communicating results to users and the general public</p> <p>(3) Diagrams, maps and charts work better than pages of tables</p>	<p>(1) Very important to identify the different audiences for NCA and ILM</p> <p>(2) Very important to be able to demonstrate the value of account production to the ILM community</p> <p>(3) Good examples are important</p> <p>(4) need to recognize the limits of data quality</p>
Potential in decision making (use in policy cycle)	<p>(1) So far mainly useful in the identification of issues, bringing stakeholders to the table, development and implementation of interventions at local level</p> <p>(2) Could be scaled up to be useful at higher levels (national and multi-country)</p> <p>(3) Strengthen role as collective actor in achieving global goals for sustainable development</p>	<p>(1) So far mainly used in monitoring, review and problem identification at national level</p> <p>(2) Could be used at subnational levels and in other parts of the decision-making cycle with additional analysis and modelling could be used in policy design and implementation, mainly useful in the identification of issues, development and implementation of responses</p>	<p>(1) Monitor and review the sustainability of current land use and land management</p> <p>(2) Assess trade-offs between different management and investment decisions</p> <p>(3) Identify hotspots in need of land use and land management change</p> <p>(4) Can be applied to international agreements such as the SDGs and CBD</p>
Challenges in policy cycle use	<p>(1) ILM developed as a bottom up approach and national level (sectoral) policies could be more aware and supportive</p> <p>(2) Decision making at local level influenced by many factors including poverty, immigration and large government and non-government businesses involved in resource use</p>	<p>(1) Account producers are often statistical officers which deliberately do not extend into policy interpretation and analysis</p> <p>(2) Accounts are usually at the national level and hence need to be scaled down to be useful for ILM decisions</p>	<p>(1) Need to align international, national and sub-national decision-making processes and priorities</p> <p>(2) Information needs to be seen as important</p> <p>(3) information needs to be available when decisions are being made and hence ILM and NCA need to be "ahead of the game"</p>

FULL RESULTS

1 Introduction

This paper has been prepared as a background document for the 4th Policy Forum on Natural Capital Accounting for Better Policy being held in Kampala Uganda, 18-19 November 2019¹. The focus of the 4th Policy Forum is the application of natural capital accounting (NCA) to integrated land management (ILM).

The key objective of the forum is to explore how NCA and ILM can work together to accelerate both national agendas, such as land use planning and protection of ecosystem services, and international goals and targets, such as the Bonn Challenge, the Paris Agreement on Climate Change, and the post-2020 Global Biodiversity Framework. In this the Sustainable Development Goals are touched upon, but are not the primary of the 4th Forum as they were the explicit focus on the 2nd Policy Forum² and subsequent publication (Ruijs and Vardon 2018).

The expected participants of the 4th Policy Forum are government representatives from developing and developed countries, as well as from organizations working on accounting, environmental-economic policy, and landscape management at subnational levels or industry (e.g. agriculture, forestry, conservation, etc.). To assist discussions between the various agencies and groups of expertise, this document provides:

- An introduction to ILM and NCA
- Examples of how the concepts and practices of ILM and NCA have come together in countries
- Thoughts from a sample of experts on the benefits and challenges of integration of ILM and NCA
- An assessment of how ILM and NCA can be integrated and what the benefits from this are likely to be
- Some thoughts on how the integration ILM and NCA can be progressed

¹ <https://www.wavespartnership.org/en/forum-natural-capital-accounting-better-policy>

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

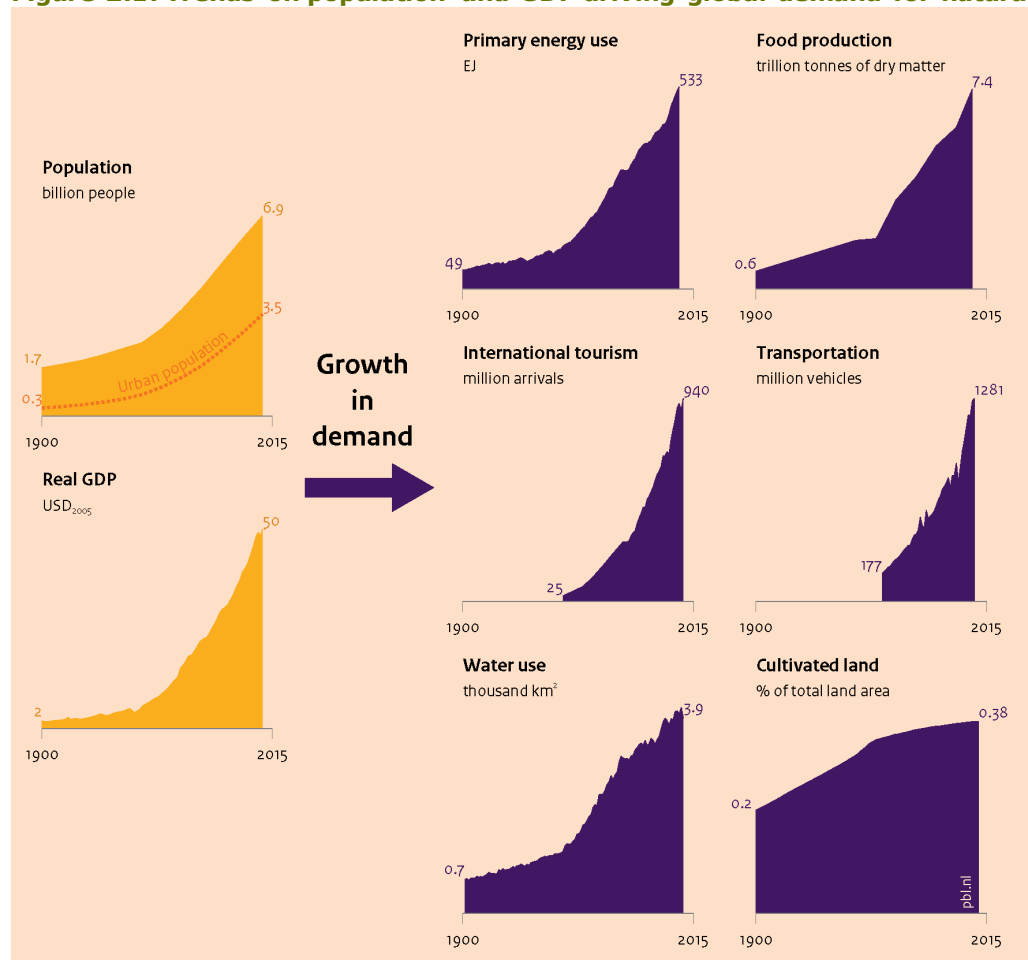
2 Integrating multiple objectives in landscapes

This section provides an overview of the background and application of landscape approaches as a means for balancing multiple objectives and integrating interests from local to global stakeholders. It then focuses on Integrated Landscape Management as a process aimed at enabling stakeholders to manage, plan, implement and monitor actions to support their goals.

2.1 Global trends: increasing and competing claims on natural resources

Growing populations and the resulting rising demand for land, food, fibre, water and energy are putting ever-growing pressure on natural resources and causing continued loss of biodiversity.

Figure 2.1: Trends on population and GDP driving global demand for natural resources



Source: PBL People and the Earth report, 2017

In September 2015, the global community adopted the 2030 Agenda for Sustainable Development, which includes a set of 17 Sustainable Development Goals (SDGs) and 169 targets. The SDGs provide

a framework for countries to plan and achieve an a comprehensive, balanced and integrated development vision for 2030. Such a framework is needed as there will be competition for resources between the individual development goals.

Conventional policy approaches that assume particular lands have one priority objective and ‘trade-off’ other objectives are no longer viable in much of the world (Gray et al., 2016; Shames et al., 2017).

The recent Global Assessment Report on Biodiversity and Ecosystem Services produced by the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES, 2019) identified that, for terrestrial and freshwater ecosystems, land use change has had the largest negative impacts on nature since the 1970s. Given that conversion of natural lands and waters to agriculture and aquaculture is a leading cause of biodiversity loss, mainstreaming biodiversity and information on natural resources into development planning and production sectors has never been so important as it is today.

The latest IPCC Report on Climate Change and Land (IPCC, 2019) describes the relation between climate change, land degradation, food security and greenhouse gas in detail. The report states that priority should be given to response options that do not necessarily lead to greater competition on land, but which rather have the potential to provide multiple co-benefits in the sense of climate change mitigation and adaptation, combating desertification and land degradation, and enhancing food security.

Spatial planning and land governance are becoming more and more important as cumulative pressures from the demands for food, feed, biofuels, nature conservation, and urban expansion lead to increasing competition for natural resources and also have an impact on the flows of ecosystem services. This may be either direct competition between various types of land use and land management within countries, or competition spurred by international trade between countries (Van der Esch et al., 2017).

2.2 Challenges converging at the landscape level

The specific actions that are required to achieve the 2030 development vision of countries will need to be planned and implemented at both national and sub-national scales. At sub-national scales stakeholders are able to implement and more clearly understand the impact of specific actions. This follows the desire to holistically balance multiple goals related to both environmental and non-environmental processes, for example, livelihoods and sustainable resource management (Freeman et al., 2015). In conjunction with national and regional spatial planning, interactive and adaptable spatial and land-use-planning processes need a strong bottom-up component as the issues are highly context-specific. Here the overlapping interests of a range of stakeholders can best be integrated within a multifunctional landscape (CBD, 2014; UNCCD, 2017).

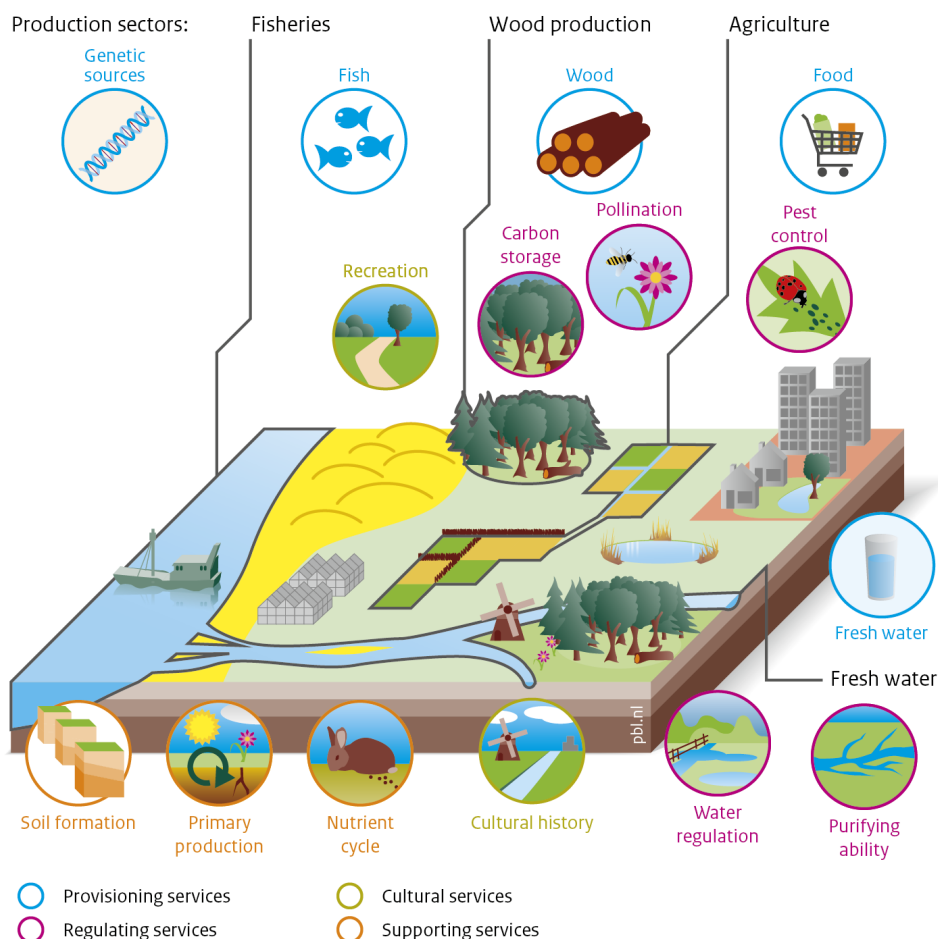
The interaction of people and nature in landscapes has evolved over time. With increasing globalization and the integration of people in global production supply chains, landscapes are today more and more seen as the spatial scale where many different stakeholders from global to local level need to cooperate for balancing of competing interests and managing risks (Brasser, 2012; Scherr et al. 2012). Over several decades, the view of landscapes has developed from a perspective of geophysical boundaries in which landscapes were led by processes of nature, towards a perspective of a physical space in which not only nature, but also human actors and economic supply chains play decisive roles.

Until now, the Landscapes for People, Food and Nature (LPFN) initiative has identified over 80 terms and definitions that refer to the governance and management of landscapes. Depending on their scientific roots, either political sciences, development economics or ecology, these include descriptions that focus more on the cultural identity of landscapes where the “sense of place” is a key element, or on the integration of conservation and development plans or center on the (ecosystem) services a landscape provides. By using the definition of Denier et al. (2015), that a landscape is a socio-ecological system that is organized around a distinct ecological, historical, economic and socio-cultural identity, these various dimensions are captured, while also recognizing that landscapes can also be seen as mosaics and multi-functional (Arts et al., 2017).

As such, landscape can serve as a uniting concept for various disciplines that deal with the human environment and its challenges, offering a common ground to both scientists, sociologists, economists and land management practitioners. Each group has different backgrounds, values, norms, ideas, and interests and can all meaningfully engage with landscape planning and management (Arts et al., 2017, Zurba et al., 2019).

Figure 2.2: Various ecosystem services positioned in a production landscape

Examples of ecosystem services for production sectors



Source: PBL

A multi-functional landscape aims to simultaneously meet a range of local needs, (e.g. ensuring water availability; protecting biodiversity for crop pollination and wildlife tourism; producing nutritious and profitable crops), while also contributing to national commitments for global targets

(e.g. for the SDGs, net reductions in land-based greenhouse gas emissions; targets for biodiversity conservation; generating power from renewable resources) (Thaxton, et al., 2015).

Describing the functions of a landscape using the concept of ecosystem services is common (De Groot et al, 2010; Hein et al, 2016). The Common International Classification of Ecosystem Services (CICES), which is the recommended classification for accounting within the SEEA framework, recognizes three categories of ecosystem services: provisioning services (e.g. food and timber production), regulating services (e.g., carbon storage and sequestration), cultural services (e.g., biodiversity values in local culture). Elsewhere supporting services (e.g., nutrient cycling) are recognized as another category of ecosystem services. All of these types of ecosystem services can all be placed in the context of a landscape and therefore allow for analyzing synergies and tradeoffs among different ecosystem services resulting from changes affecting the landscape.

By focusing on interactions and the ability to identify the various actors causing change or able to cause change, the landscape therefore seems a useful unit for assessing and achieving the SDGs (Thaxton, et al., 2015).

2.3 The landscape approach: promoting inclusion and sustainable development

Sectoral approaches for different land-use activities have largely dominated the resource management field. However, such approaches have not reflected the multi-sectoral [and indeed non-sectoral] nature of most landscapes, which can include local communities, smallholder farms, protected areas, recreational activities, tourism enterprises, and/or commercial scale resource industries such as agriculture, forestry, or mining (Freeman et al., 2015; Reed et al., 2016; Scherr and McNeely 2008).

In response to this recognition, the landscape approach has increasingly been promoted in both science, policy and practice as an alternative instrument to conventional, sectorial land-use planning, governance, and management (Arts et al, 2017; Van der Horn and Meijer, 2015; Shames et al, 2017). Historically, the concept was popular in the 1980s, drawing on integrated approaches from spatial planning. It was inspired by discussions on nature conservation strategies in developed economies and fueled by debates on trade-offs between conservation goals and livelihood needs in developing economies.

Since the 1990s, and in particular after the Rio Earth Summit in 1992, the landscape approach has been linked mainly to sustainable development. The concept urges cross-sectoral, multi-stakeholder, and policy integration at the “appropriate” scale, including landscapes (Arts et al., 2017, Sayer et al., 2013).

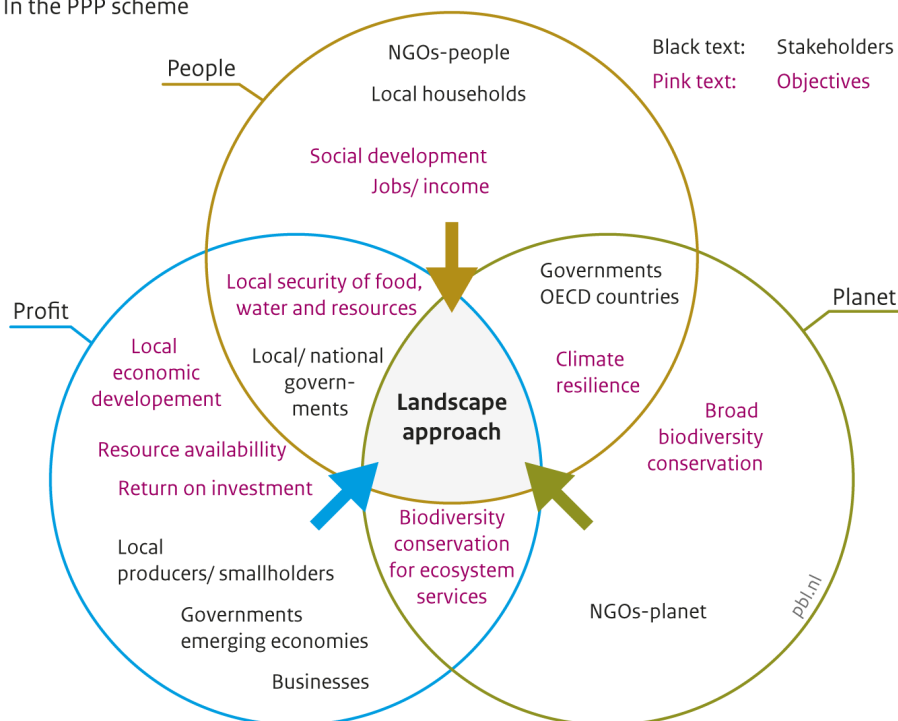
Reed et al. (2015) captured the main characteristics of a landscape approach describing it as:

“A landscape approach is a multifaceted integrated strategy that aims to bring together multiple stakeholders from multiple sectors to provide solutions at multiple scales. It can be broadly defined as a framework to address the increasingly widespread and complex environmental, economic, social and political challenges that typically transcend traditional management boundaries”.

Figure 2.3: Overview of the different stakeholders, based on their primary interests, and the different objectives pursued in integrated landscape approaches positioned within the People, Planet, Profit (PPP) scheme.

Overview of the stakeholders and objectives pursued in landscape approaches

In the PPP scheme



Source: PBL

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This description explains that as well as providing an alternative to conventional sectoral planning, the landscape approach has also gained interest for its potential to deal with so-called wicked problems (complex issues laden with many uncertainties such as climate change, biodiversity loss, or sustainability in general), and to address the many trade-offs and inequalities among various competing claims on land and resources (e.g. by agriculture, mining, housing, leisure and nature conservation) (Arts et al., 2017; Gray et al., 2016; Sayer et al., 2013; Van der Horn and Meijer, 2015). It also has been advocated to make policy, governance, and management more space- and scale-sensitive and to better take into account the linkages among humans and their surroundings.

The recent IPBES and IPCC reports are also confirming the need for further developing and operationalizing of landscape approaches. The main messages from the IPBES report clearly mention that “cross-sectoral landscape approaches offer opportunities to reconcile multiple interests, values and forms of resource use, provided that these cross-sectoral approaches recognize trade-offs and uneven power relations between stakeholders. Integrated landscape governance entails a mix of policies and instruments that together ensure nature conservation, ecological restoration and sustainable use, and address the major drivers of biodiversity loss and nature deterioration” (IPBES, 2019)

This is also seen within the UN CBD submissions for national biodiversity strategy and action plans where more attention is given to integrated approaches at the landscape level (Uetake et al., 2018). For its new post-2020 strategic framework, landscape approaches are also gaining interest as a suitable framework for contributing to the realization of CBDs vision of “Living in Harmony with Nature” by 2050.

2.4 The landscape approach in practice

The landscape approach aims to integrate the different objectives of various stakeholders to create a sustainable system of landscape management from which all stakeholders can benefit. To achieve this there are three general dimensions to be considered in developing an integrated landscape approach (FAO 2012; Scherr et al., 2013; World Bank 2014):

- *Horizontal*: spatially optimizing, across different decision makers, the management of various sectors that depend on natural capital: agriculture, livestock, forestry, fisheries and nature conservation, to ensure that across the landscape synergies are taken advantage of and trade-offs are minimized;
- *Vertical*: taking into account the external drivers, such as higher-level institutions (e.g. land tenure), policies (e.g. subsidies on energy or green technologies), markets (including financial institutions) and supply chains (e.g. prices of agricultural products and consumer demand), climate, and technology. These drivers influence the diverse sectoral activities within the landscape and might change the relationships between them, but could also provide opportunities;
- *Time*: ensuring that inclusive green growth is achieved through built-in, inclusive, well-informed decision-making processes that will respond quickly to internal and external changes to the landscape, as well as that decision-making is based on long-term sustainability goals.

Given the diversity of landscapes worldwide, it is not surprising that there is no single blueprint for implementing a landscape approach. Sayer et al. (2013) addressed this by developing a set of design principles to guide landscape-level processes in an inclusive, democratic, and transparent way, by acknowledging that such a process is hard to predict and should be characterized as “muddling through” and “learning by doing” rather than careful design and planning.

The ten principles of the Sayer et al. (2013) paper “landscape approach to reconciling agriculture, conservation, and other competing land uses” are:

1. The dynamic nature of landscapes forms the basis for continual learning and adaptive management.
2. Intervention strategies are built on common concerns and shared negotiation.
3. Landscape processes are shaped by influences from multiple scales.
4. Landscapes are multifunctional by nature, which requires choices and trade-offs.
5. Multiple stakeholders frame objectives differently, hence all stakeholders need to be engaged.
6. Trust among stakeholders is crucial to build up a negotiated and transparent change logic.
7. Clarification of rights and responsibilities, especially regarding land and resource use, is a necessity.
8. Monitoring of progress has to be done in a participatory and user-friendly manner.
9. System-wide resilience is to be achieved through recognizing threats and vulnerabilities, and the capacity to resist and respond.
10. The complexity of landscape processes requires strong capabilities of all stakeholders involved.

A prerequisite for all principles is that all stakeholders are able to generate, gather, and integrate the information they require to interpret the activities, progress, and threats. The gathering and interpretation of information is a vital part of developing and updating the “theories of change” on which the landscape approach is based (Sayer et al., 2013).

The 10 principles were adopted by the Convention on Biological Diversity to “improve sustainable use of biodiversity in a landscape perspective” (UNEP 2011). Based on a review of selected

landscape projects in Africa and Asia it turned out that in practice, the principles were selectively applied and often adapted to specific local conditions and needs (Sayer et al., 2016). However, there is overall agreement that participation, interdisciplinarity, multifunctionality and sustainability are the main concepts of an integrated landscape approach (Freeman et al., 2017).

Currently there are several global initiatives promoting the concept of the integrated landscape approach, their implementation in initiatives and organizing dialogues and learning events. These are:

- *Landscapes for People Food and Nature* (LPFN) initiative: a network of organizations promoting to create and sustain integrated agricultural landscapes. Partners ranging from global partners like FAO, ICRAF and World Bank to local NGOs.
- *Global Partnership on Forest and Landscape Restoration* (GPFLR): a network focusing on restoration projects contributing to the Bonn Challenge, driven by IUCN.
- *Global Landscapes Forum* (GLF): a knowledge-led platform on sustainable land use, dedicated to achieving the Sustainable Development Goals and Paris Climate Agreement, organized by e.g. CIFOR, UNEP and World Bank.
- *Satoyama Initiative*: a global network inspired by the CBD, focusing on working together to realize societies in harmony with nature and emphasizing the cultural identity of landscapes.

Between 2013 and 2016, the LPFN initiative surveyed 428 examples of locally-driven, long-term integrated landscape initiatives (ILI) in Latin America, Africa, Asia and Europe. The overall conclusions of the study were: (1) they all involved stakeholders from different scales and sectors; (2) had been operational for several years, and; (3) were working toward multiple objectives for agriculture, environment and human well-being. The geographic areas of the initiatives ranged from ten square kilometers to tens of thousands of square kilometers, with populations from several thousand people to several million. More than 90 percent of the initiatives included farmer organizations as key partners, while it was also noted that the involvement of private sector actors could be improved. Though most of the claimed achievements of the ILIs were self-reported by the survey respondents and not backed by quantitative results, 90% of Asian ILIs reported having available baseline data, monitoring and evaluation components, to quantitatively analyze ILI outcomes over time. With respect to the surveyed African and Latin American ILIs however, a greater research investment is urged towards collecting and analyzing quantitative data on multiple landscape outcomes, that would provide independent verification. Data should be disaggregated in ways to reveal, for instance, the distribution of changes in food production, income, and use of natural resources across a landscape (Estrada-Carmona et al., 2014; Garcia-Martin et al., 2016; Milder et al., 2014; Zanzanaini et al., 2017).

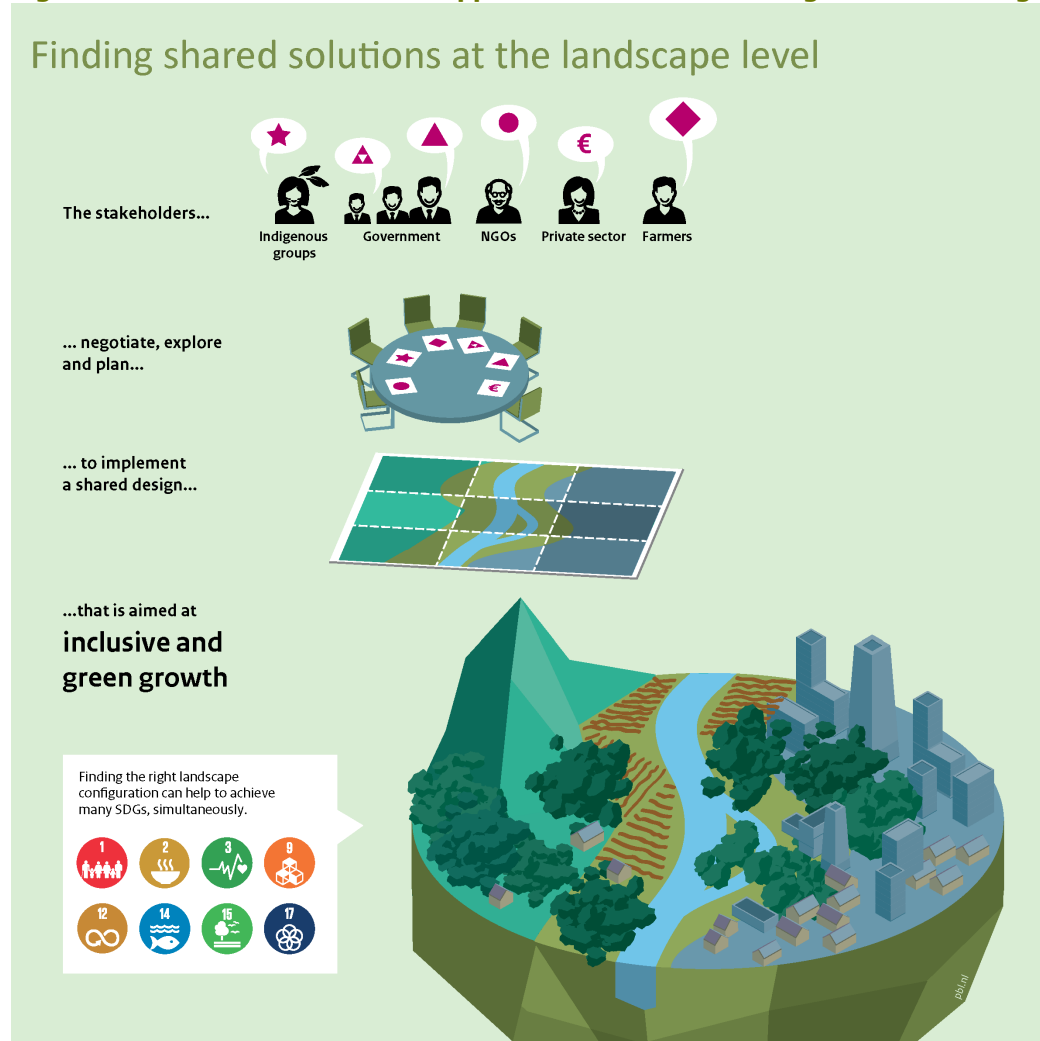
Key critiques of the implementation of the ILM and NCA approaches was the naivety of focusing on creating win-win solutions, the ambition of achieving cross-sectoral integration in a world of governmental policy silos and with scattered and non-standardized data. To address these criticisms, ILM and NCA approaches require integrated institutional development via multi-stakeholder platforms, governance strategies and assessments, and supporting processes on joint learning, negotiation and reflection, backed by regular, independent, structured and authoritative data (Arts et al., 2017; Bass et al., 2017; Burgi et al., 2017; Kusters, 2015).

2.5 Managing the multi-stakeholder process in a landscape approach

Integrated Landscape Management (ILM) is the process by which managers and stakeholders can plan, implement and monitor actions to support their goals, including the SDGs, at a workable scale. ILM is suited for landscapes where there are strong interactions and interdependencies around

natural resource use and management. In most such places, government policies alone cannot resolve trade-offs or mobilize synergies between different stakeholders. Stakeholders need to be directly involved in negotiations and make commitments to incorporate collaboratively agreed strategies and objectives into their own businesses and programs (Ros-Tonen et al., 2018).

Figure 2.4: A multi-stakeholder approach towards achieving inclusive and green growth



Source: PBL People and the Earth report, 2017

An effective ILM process can create an improved understanding among stakeholders of the conditions and dynamics in the landscape, and result in a plan for action that includes win-win interventions, realizes opportunities for blended investments, and mobilizes collaborative action to improve institutional and policy conditions. Integrated Landscape Management, regardless of the 'entry point' for action in a particular landscape or the community of practice, has five key features (Scherr, Shames and Friedman, 2013):

1. There are shared or agreed management objectives that encompass the economic, social and environmental outputs and outcomes desired by stakeholders in the landscape (commonly human well-being, poverty reduction, economic development, food and fibre production, climate change mitigation, and conservation of biodiversity and ecosystem services).
2. Field, farm and forest practices are designed to contribute to those multiple objectives.
3. Ecological, social, and economic interactions among different parts of the landscape are managed to realize positive synergies among interests and actors or to mitigate negative trade-offs.

4. Collaborative, community-engaged processes are in place for dialogue, planning, negotiating and monitoring decisions.
5. Markets and public policies are shaped to achieve the diverse set of landscape objectives.

ILM implementation generally also follows a learning and negotiating cycle with five key elements (Scherr, Shames and Friedman, 2013):

1. Formation and organization of the multi-stakeholder platform;
2. Development of a shared understanding among stakeholders of landscape challenges and opportunities;
3. Agreement on broad ambitions for the landscape, strategies to achieve them, and an action plan;
4. Implementation, with refined intervention design, associated investment and policy action and;
5. Monitoring and impact assessment to inform the next cycle of stakeholder action. Spatial information and analysis, and land-use planning, potentially, play a strategic role in each of these elements, helping to identify those land uses and management regimes that best meet the demand from stakeholders in different parts of the landscape, while safeguarding soil, water, and biodiversity for future generations.

Table 2.1: Role and contributions of knowledge providers in the learning circle

P1: Understanding of the functioning of the landscape; P2: Exploring societal demands and environmental change; P3: Designing future landscape options; P4: Transforming based on negotiated interventions (adapted from Burgi et al., 2017)

Knowledge Provider	P1	P2	P3	P4
Scientific community	-Methodology for synthesizing -State of the art ecological knowledge	-Climate change scenarios -Global change scenarios -Projections of ES demands	-Modelling framework -Optimization models	-Process moderating -Policy analysis -Prototype effectiveness evaluation
Citizens, local land users and community based organizations	-Local ecological knowledge	-Local needs considering climate/global change	-Scenario building -Participation in design of landscape options	-Participating in learning platforms (farmer to farmer)
Government authorities	-Institutional knowledge	-National/regional priorities	-Scenario building -Participation in design of landscape options	-Policy framing and opening
Development agencies	-Internationally demanded ES	-Locally adapted SDGs	-Official Development Assistance (ODA) agendas as input to scenario building and design of landscape options	-Resources to test identified development options
Success indicators	Improved system understanding, joint learning on landscape potentials and threats	Set of scenario inputs developed that both reflect the local needs, as well as fitting the national and global context and ambitions	Set of alternative landscape options adapted to varying scenario contexts on which ownership is shared by the different participants in the co-design process	Prototype for landscape options implemented or policy options put forward and discussed; increased commitment for action and implementation with all stakeholders

With respect to the learning and negotiation cycle, Burgi et al (2017) identify 4 pillars, similar to the ILM cycle elements, and illustrate the role and contributions of various knowledge providers (Table 2.1). This ranges from local ecological knowledge to improve understanding of landscape processes to information required for spatial modelling and scenario building (Meijer et al. 2018).

2.6 Connecting to spatial planning, policy and decision making

Spatial planning is seen as an important instrument that could support the ILM process, and vice versa. The negotiated outcomes from discussions in a multi-stakeholder platform could improve spatial and land use plans by creating more support by making them more inclusive (Tisma and Meijer, 2018). According to Shames et al. (2017) governments that want to achieve sustainable landscapes will need to aim for the following goals:

- Articulate a policy vision for integrated, inclusive, and place-based approaches to development.
- Support the formation of landscape-scale, multi-stakeholder decision making processes.
- Address improper or incomplete laws and regulations.
- Shift prevailing incentives for action by farmers, companies and investors.
- Improve the quality and availability of information and knowledge for stakeholders so that they can manage their landscapes for multiple objectives.

Following these policy goals, in order for ILM to benefit from and influence spatial and land use planning, credible and up-to-date datasets describing status and flow in natural resources and ecosystem services is required (Albert et al., 2014; Boyd et al., 2018; De Groot et al., 2010; Vardon et al., 2018). This is the kind of information that is gathered for Natural Capital Accounting. In the next sections we will focus on the links between ILM as process managing interest and use of natural resources and NCA.

3 Natural capital accounting in landscapes

This section introduces natural capital accounting (NCA) – what it is, who produces it and who uses it. It then goes on to describe the links between NCA and integrated land management, summarizing the range of work that has been done in countries.

3.1 Background on natural capital accounting

Natural capital accounting is undertaken or being developed by governments in more than 100 countries³. The level of work varies greatly, with some countries having annually produced a suite of accounts for some time, to countries that are just beginning to produce accounts. Box 3.1 is a brief introduction to natural capital accounting, while examples of accounts can be found in databases of the World Bank⁴ and United Nations⁵. In the work done to date, some has been at the national level, while other work has been at subnational levels. While most work has been by government agencies, there are a few examples of academic institutions and non-government organizations producing accounts. Much of the accounting work, particularly at the subnational level, is aiming to provide information for land and water management.

Examining the production and use of natural capital accounts at the Policy Forum on Natural Capital Accounting for Better Decision Making⁶ in policy has led to the development of Ten Principles for making accounting fit for policy purposes (Table 3.1).

There is a good *prime facie* case for using NCA in integrated landscape management. Firstly, conceptually the beforementioned 10 principles of ILM (Sayer et al., 2013) can be successfully mapped to NCA (Table 3.2). Secondly, there are a number of examples of accounts produced with the purpose of aiding land management (Table 3.3).

³ Global Assessment of Environmental-Economic Accounting 2017. <https://unstats.un.org/unsd/statcom/49th-session/documents/BG-Item3h-2017-Global-Assessment-of-Environmental-Economic-Accounting-E.pdf>

⁴ WAVES Knowledge Centre <https://www.wavespartnership.org/en/knowledge-center>

⁵ System of Environmental-Economic Accounting – Data <https://seea.un.org/content/data>

⁶ See <https://www.wavespartnership.org/en/policy-forum-natural-capital-accounting-better-decision-making>

Box 3.1. What is natural capital accounting?

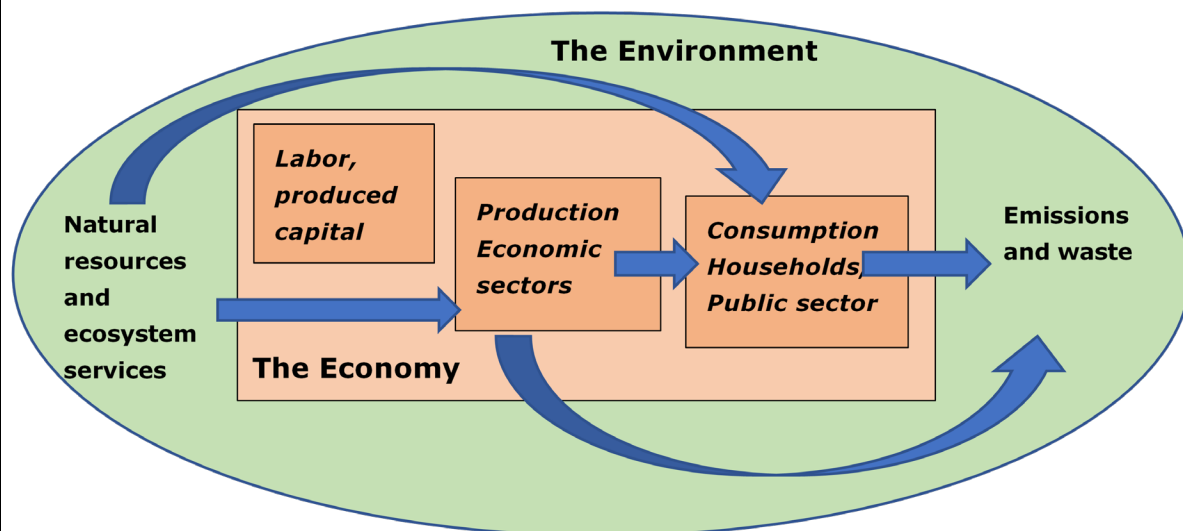
Natural capital accounting integrates natural resource and economic analysis, providing a broader picture of development progress than standard measures such as GDP (Gross Domestic Product).

Natural capital accounts are a set of objective data that show how natural resources contribute to the economy and how the economy affects natural resources. These accounts can provide detailed statistics for better management of the economy, such as accounts for the inputs of water, timber and energy as well as the outputs of pollution, that are needed to model green-growth scenarios. The use of ecosystem services by the economy and people are also important to consider.

The concept of accounting for natural capital has existed for more than 30 years. In 2012, the United Nations Statistical Commission adopted the System for Environmental and Economic Accounts (SEEA). This system provides an internationally agreed-upon concept and method for account production. Accounting for ecosystem services is relatively new, with an experimental framework made available in 2014.

The figure below illustrates the universe of natural capital accounts. The data that go into the rectangle representing the economy are from the System of National Accounts (SNA) and are economic in nature. The natural capital accounts provide data on natural resources, such as minerals, timber, and fisheries going into economic production and consumption, as well as the resulting emissions and waste. Integrating data on economic activities and the environment enables the analysis of different scenarios, for example, how the development of the economy affects the environment or how the degradation of the environment will affect the economy. This in turn enables the development and application of better policies that take into account the links between the environment and the economy.

The environmental and economic context for NCA:



For more information on this topic, see the WAVES website, Natural Capital Accounting, <http://www.wavespartnership.org/en/natural-capital-accounting> , and System of Environmental Economic Accounting, <https://unstats.un.org/unsd/envaccounting/seea.asp>.

Table 3.1 Ten living principles for NCAs fit for policy purpose

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-centered	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

Source: Bass et al. (2017)

3.2 What roles can an NCA play in ILM?

There are number of land management actions that can be informed by the accounts, for example, allocating and managing land to:

- Achieve sustainable development
- Assess trade-offs between social, economic, and environmental use of land
- Maximize economic returns from investments in land and land management
- Minimize environmental degradation from economic activities on land

The use of natural capital accounts to achieve the Sustainable Development Goals (SDGs) has been examined in detail by Ruijs et al. (2018), so will not be considered further except to note that:

- The accounts are particularly relevant to measuring the progress towards SDG 15, Life on land as well as several goals related to land (SDG 2. Zero hunger; SDG 6 Clean water and sanitation; SDG 12 Sustainable consumption and production, and; SDG 13 Climate action).
- So far the accounts have not been used to either analyze progress towards SDGs or design policies that would help achieve the SDGs

Table 3.2: The 10 principles for an integrated landscape approach (Sayer et al. 2013) linked to natural capital accounting

Principle name and number	Notes on the principle	What NCA offers to implement the ILM principle
1. Continual learning and adaptive management	Expensive, slow, difficult to show results, disconnect with funding cycles, risk aversion, requires analytical skills, burn out	NCA can provide a regular suite of data that can inform government, business and individual decision making – this relates NCA Principle 9 Continuously improving. A feature of macro-economic management is the regular data available from the SNA and other sources and institutions that know how to interpret and use the data. Regular production of NCA could lead to the development of similar institutions for environmental and “sustainability” management
2. Common concern entry point	Lack of common entry point, entrenched position, conflict and distrust	Accounts can provide a common and trusted entry point for diverse agencies in the public and private sectors. This may be useful for increasing trust and credibility (NCA Principles 6 and 7), identifying areas of real difference and enabling different “players” to find common ground and work towards shared solutions.
3. Multiple scale	Lack of methods for scaling up, endless complexity, time lags, limited predictability, disconnect between levels, difficulty of linking local to macroscale drivers of change	NCA can be scaled. It has grown out of national level macro-economic management but increasingly there are sub-national accounts applied to local and regional issues. This is related to NCA Principle 5 Demand-led, providing information at the right scale.
4. Multifunctionality	Difficulty to manage diversity and complexity, trade-offs, incorporate multiple intangible values	NCA includes measurements in physical and monetary units and allows trade-offs to be assessed in multiple ways (e.g. non-monetary benefits can be assessed against changes in economic output and the condition of the environment).
5. Multiple stakeholder	Conflicting objectives, hidden agendas, identifying appropriate stakeholders, lack of capacity, power imbalance, lack of conceptual frameworks, distrust, high transaction costs, communication breakdowns	NCA presents a range of information. It links economic information to environmental information in a conceptual framework. With regular production on NCA, over time the framework and data presented will become better understood and used by different “players”. This should also reduce transaction costs and improve understanding between different groups and is NCA Principle 1,2, and 3: inclusive, collaborate and holistic.

Principle name and number	Notes on the principle	What NCA offers to implement the ILM principle
6. Negotiated and transparent change logic	Hidden agendas, conflict of interests, lack of accountability, corruption, different norms and mediation institutions	NCA provides a standard system for measuring the environment and the economy and NCA Principles 6 and 7, respectively transparent and open and credible. The logic of NCA is outlined in international documents that are adopted through formal UN processes.
7. Clarification of rights and responsibilities	Legitimacy, overlapping rights or claims, unequal access to justice, corruption, power imbalances, lack of awareness, knowledge and education	NCA provides information to all. It is useful for information provision to be separated from policy decisions as occurs for economic decisions, with the SNA produced by statistical agencies, whereas economic decisions are made by central agencies and departments of finance, economic planning, etc.
8. Participatory and user-friendly monitoring	High transaction costs, lack of capacity, no linkage to decision making and benefits, formal vs. informal monitoring, social and political structure, credibility	The development of NCA needs to be inclusive and collaborative (NCA Principles 1 and 2). In addition, NCA, and in particular the SEEA, has developed via international processes and builds on national statistical processes that deliver economic information, via the SNA, linked to environmental information. This makes the information credible (NCA Principle 7). These processes have data quality assurance processes and in most countries the SNA data is seen as credible by most. NCA can leverage this credibility
9. Resilience	Complexity, difficult to operationalize, inherent uncertainty in system, insufficient information, basic concept used ambiguously	NCA can be mainstreamed (NCA Principles 8-10) providing a flow of information. In addition, NCA via ecosystem accounting can be used to operationalize and investigate "resilience". It may be able to define more precisely, in terms of ecological function and how this relates to economic production and human wellbeing, what is meant by resilience (e.g. is it the environment or human activity and the environment). This process is in line with NCA Principle 5, Demand-led.
10. Participatory GIS	Lack of basic education and skills, limited government and institutional investments, short term projects, ubiquitous situations of weak governance and institutional failures make operationalization difficult	Regular production of NCA at multiple spatial scales would provide a framework for operationalizing participatory GIS. This is very much in line with NCA Principles 8, 9 and 10 on mainstreaming NCA production. It would also provide a framework for government investment in data organization and data use.

Table 3.3 provides a summary of existing accounting work related to integrated landscape management at both national and subnational levels. In general, national statistical offices have focused on national level accounting, while other agencies and academic researchers have worked at subnational levels. As the table shows, water, land or ecosystem accounts have been the main accounts used to assess land management issues.

Table 3.3: Summary of NCA and ILM examples

Country	Account types produced	Land management issues	References
Australia	Water Land Ecosystem	Protected area management - Great Barrier Reef - Victoria Water supply Forest management Water shed management	ABS (2017) Eigenraam et al. (2013) ABS and BoM (2019) Varco et al (2013) Keith et al. (2017)
Botswana	Water	Water supply management	Pule and Galegane (2017)
Brazil		Water resource management	IBGE (2018)
Canada		Clean growth & climate policy analysis; trade agreement analysis; forest carbon budget (2018)	Ruijs and Graveland (2019)
Colombia	Forest Water Ecosystem	Forest Water pricing Water shed management - Lake Tota - Chinchina - Orinoquia	DANE (2017) Romero et al (2017a) Romero et al (2017b)
Costa Rica	Forest Water CO ₂	Timber supply Water supply Ecotourism Climate change	Gutiérrez-Espeleta (2017) Rivera et al. (2017) The Contribution of Energy and CO ₂ Accounting to Policy in Costa Rica
Guatemala	Land Forest	Forest management Fuelwood supply	Castaneda et al. (2019)
Indonesia	Land Ecosystem	Management of forest and peatland	Garrido, L., et al. (2019)
Madagascar	Water	Water supply	BRL (2016)
New Zealand	Forest	Forest management	Yao et al. (2019)
The Netherlands	Ecosystem	Food and water supply and nature conservation	PBL (2016), Atlas Natural Capital (2019), CBS (2018)
Peru	Ecosystem	Water management Biodiversity conservation	Portela et al. (2018)
The Philippines	Ecosystem	Water management and pricing including valuation and biophysical monitoring; Local landscape management; Assessing mangroves & coastal protection; fisheries	Reported at the 2016 Policy Forum

Country	Account types produced	Land management issues	References
			Reported at the 2018 Policy Forum
Rwanda	Land Water	Land use planning; Review of Water Master Plan; biophysical monitoring & indicators (2016)	Reported at the 2016 Policy Forum ⁷
South Africa		Spatial Planning Ecosystem restoration Water security Protected Area expansion Biodiversity mainstreaming	Reported at the 2017 Policy Forum ^{8, 9} Reported at the 2018 Policy Forum ¹⁰
Uganda	Ecosystem	Protect area management Species management	King et al (2018) UNEP-WCMC and IDEEA (2017) Land accounts from government yet to be officially released
United Kingdom	Land Forest Ecosystem	Urban planning Forest management	Harris and Smith (2019)
Zambia	Water Forest Land	Climate risks to water supply and biodiversity; forest production modelling incl honey	Yet to be officially released but reports at 2018 Policy Forum ¹¹

⁷ Rwanda NCA Process and potential

<https://www.wavespartnership.org/sites/waves/files/images/3b%20Rwanda%20NCA.%20Process%20and%20potential%20Application.%20November%2017%252c%202016.pdf>

⁸ Policy applications: Spatial planning, ecosystem restoration, water security and protected areas https://www.wavespartnership.org/sites/waves/files/images/Session%205.3%20-%20NCA%20Policy%20Forum%20Nov%202017%20South%20Africa%20Mandy%20Driver_part%202.compressed.pdf

⁹ Policy applications of ecosystem accounts: Emerging examples from South Africa

https://www.wavespartnership.org/sites/waves/files/images/Session%205.3%20-%20NCA%20Policy%20Forum%20Nov%202017%20South%20Africa%20Mandy%20Driver_part%201.compressed.pdf

¹⁰ Natural Capital Accounts and mainstreaming biodiversity: Some reflections from South Africa

<https://www.wavespartnership.org/sites/waves/files/documents/First%20Partnership%20Meeting/Session%205-04%20NCA%20Policy%20Forum%20Nov%202018%20Biodiversity%20session%20-%20South%20Africa.pdf>. See also the SANBI website <http://biodiversityadvisor.sanbi.org/planning-and-assessment/experimental-ecosystem-accounting/>

¹¹ Zambia - climate change policy and accounting. Presentation to the 2018 Policy Forum

https://www.wavespartnership.org/sites/waves/files/documents/First%20Partnership%20Meeting/session%202-03-Zambia%20Presentation%20November%202018_V2.pdf

4 Case studies linking ILM and NCA

To help illustrate the use or potential use of the NCA for ILM we briefly highlight the experience from five case studies from Australia, Indonesia, Guatemala, Rwanda and The Netherlands. Other examples can be found in other publications, for example those referenced in Table 3.3.

The case studies were selected to show the range of experiences and the different types of uses found for accounts: (1) ecosystem accounts (Australia), (2) land and peat swamp accounts (Indonesia), (3) agriculture and ecosystem accounts (Guatemala), (4) water and land accounts (Rwanda) and (5). ecosystem accounts for the Netherlands. These span local level and national applications as well as different themes: e.g. management for water or timber supply, climate change and biodiversity conservation. In all cases trade-offs were recognized in the accounts and the information could be used in decisions about integrated land management. In addition, a key benefit of developing the accounts was that account producers and land/water management decision makers were brought together which increased understanding between these two groups. This ensured that relevant data was available and that the quality of the data was well understood. In some cases, draft accounts were revised, and new information was included in the final versions of the accounts.

4.1 Australia: forest management for timber, water and biodiversity conservation

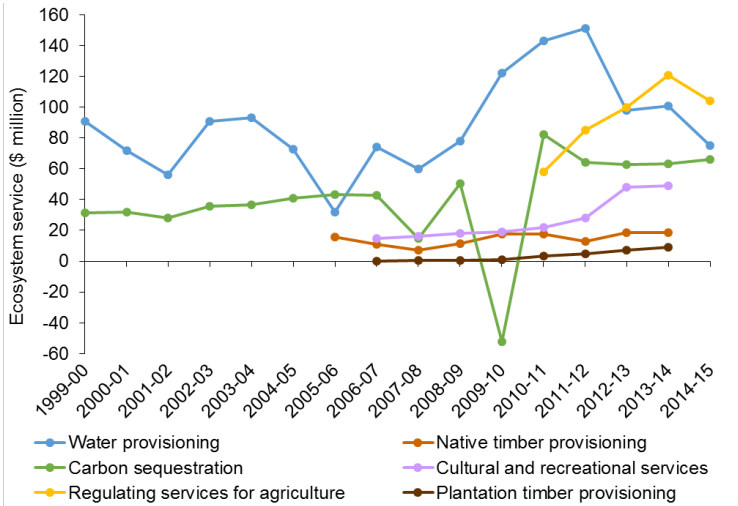
Ecosystem accounts developed in Australia for the Central Highlands region, near Melbourne, are informing government decision making process known as “Regional Forest Agreements”, which determine how forests across Australia can be used (Keith et al. 2017; Keith et al 2018). The native forest on public land in the study region is managed under a Regional Forest Agreement that guarantees wood supply within a defined area on public land and conservation within national parks. This agreement is currently being re-negotiated. Synthesizing environmental and economic information in the form of ecosystem accounts has allowed quantitative comparisons in physical and/or monetary terms that enabled trade-offs to be defined explicitly and spatially.

The study was done as native forest timber harvesting conflicts with other industries including water supply and tourism. To help assess the situation accounts of ecosystem services of water provisioning, carbon sequestration, biodiversity conservation and recreation were developed. As well as the values of ecosystem services (Figure 4.1) the economic value-added of industries that rely on the ecosystem services was also calculated.

The results indicated that a transition away from native forest harvesting would improve the condition of ecosystem assets, the conservation of biodiversity, and the provision of ecosystem services for other land uses, and would reduce the threat of extinction of critically endangered species. Economic gains from increased water supply and carbon storage exceeded the losses from ceasing native timber production. Results from the study are

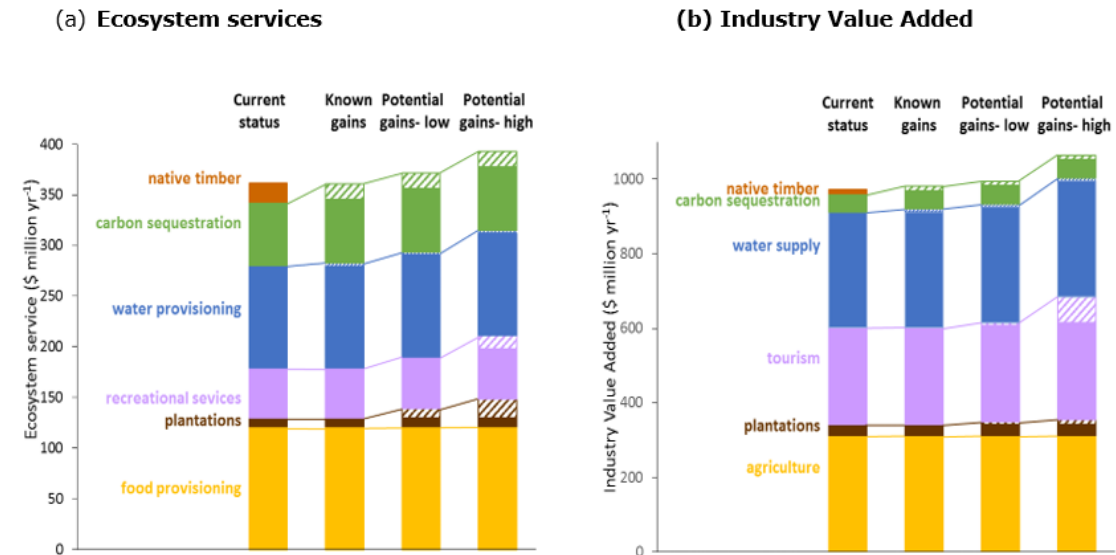
contributing to the Regional Forest Agreement as well as government decision making more generally and public education (Keith et al., 2018).

Figure 4.1: Value of ecosystem services generated in the Central Highlands study area, Australia



As part of the development of the accounts, a draft of the accounts was discussed at a workshop with a range of government agencies, academics and other interested parties¹². The discussion was important as it enabled potential users of the accounts to see what they looked like, ask questions and consider how they might use final accounts once they were completed. These discussions led to the addition of accounts for plantation forests to be added to the final accounts when they were released in 2017.

Figure 4.2: Value of ecosystem services and Industry Value Added (2013-14), and the potential changes if native forest harvesting ceased



The accounts for the Central Highlands also went beyond accounting and included estimates for how the value of ecosystem services and industry value added would change if the harvest of native forests for timber stopped (Fig. 4.2). Estimates were made for known

¹² Draft document for discussion 2016:
https://fennerschoolassociated.anu.edu.au/documents/CLE/VCH_Accounts_Summary_FINAL_for_pdf_distribution.pdf

gains, mostly to carbon sequestration and water provisioning, as well as estimates of potential gains. In this, estimates were done for high and low values and here tourism could increase as well as timber provisioning from plantation forests.

The new Regional Forest Agreement is being discussed and the accounts and the projections based on the accounts are part of information informing the process. The accounts for the Central Highlands highlighted several points:

- The need to identify the drivers of ecological change. These drivers are important to understand the reasons for change in the past that are documented in the accounts, and to allow prediction of future changes.
- The economic data available is generally for large spatial areas not related to biophysical characteristics and methodological development is needed to improve spatial attribution of economic and social data to match environmental data.
- Choosing the boundary for a study area is complex because the area of interest to stakeholders has to be aligned with the data sources available. The many sources of data integrated in the accounts use different boundaries, such as natural resource management area, catchments, local government, statistical areas, ecosystem types and land use regions. No single boundary will accommodate all the different sources of data and in general, the biophysical data needs to be scaled up and the economic data scaled down
- The need to have multiple products for the communication of information

The last point is very important as the accounts and the scenarios that were based on them are new and not understood by all. Workshops, information papers, general brochures, popular articles, use of social media and briefings of senior government officials all helped to get the accounts noticed and used, or at least recognized, in the negotiations over the long-term use of the forest (i.e. in the Regional Forest Agreements).

4.2 Indonesia: low carbon development and forest management

A direct product of WAVES involvement in Indonesia was the *Low Carbon Development Initiative for Indonesia Report* (Garrido et al. 2019). By way of background, Indonesia is a diverse archipelago nation of more than 300 ethnic groups, has the world's fourth largest population, and has the largest economy in Southeast Asia. It has a large forest area but it is shrinking due to economic development. On the positive side, from 2000 to 2010, Indonesia sustained an average economic growth rate of about 6% largely owing to its rich base of natural capital. Continuous economic growth has allowed the country to become a middle-income country with the poverty rate reducing from 70% in 1984 to less than 10% today. These gains, however, have been accompanied by significant pressure on natural capital, which is likely to threaten prospects for sustaining future growth.

Indonesia's high economic growth has relied largely on natural resources, with agriculture, forestry and fishing contributing 11.4% to GDP. Agriculture has mainly relied on expansion into new lands, with, for example, the clearing of forest for oil palm, causing many environmental problems. Forest area was reduced by 22 million ha between 1990 and 2014, resulting in reduced biodiversity and high carbon emissions (1,454 MtCO₂-eq. in 2016). The air pollution from these emissions has also caused serious health effects in Indonesia's population and recent estimates indicate that the total annual cost of premature deaths from air pollution was about 3.5% of Indonesia's GDP in 2015.

The Government of Indonesia has become increasingly aware of the overall importance of forest and is proactively addressing the challenges of managing it. More recently, comprehensive analysis of prospects of a low carbon economy allowed Indonesia's Government to better understand ways to grow the economy sustainably and reduce pressure on natural capital. Bappenas, in cooperation with several development partners, including the World Bank, introduced the Low Carbon Development Initiative for Indonesia (LCDI) to explicitly incorporate Green House Gases (GHG) emissions reduction targets into the country's Mid-Term Development Plan (RPJMN 2020-2025), along with other interventions for preserving and restoring natural resources at the regional level and for particular ecosystem types.

In this, the peats swamps of Indonesia are an important store of carbon and special accounts were prepared for them¹³ in addition to land accounts. These accounts and related modelling allowed the government to explore and understand ways to maintain economic growth while minimizing forest and peatland loss, thus keeping the emissions low. One of the key findings of the LCDI report is that a low carbon growth path can deliver an average GDP growth rate of 6% annually until 2045. By sustainably using natural resources, and by reducing its carbon and energy intensity, Indonesia's total GHG emissions can fall by nearly 43% by 2030 (see graph below).

The research carried out under the LCDI built on previous work and expanded the analysis to develop forecasts using a systems approach. Technical assistance from the World Bank under WAVES Partnership contributed to this approach and overall modelling exercise through development of natural capital methodologies, protocols, models and SEEA compliant data that were particularly useful to introduce and analyze carrying capacity. Carrying capacity is a concept that helps understand how economic growth could be constrained by the limits of natural capital and the ecosystem services they are providing (i.e. provisioning, regulating and cultural services). This represents a key contribution in terms of policy uptake by an NCA framework in the country, as this work underpins decisions that will be made in the next five-year policy cycle.

One of the key findings of the LCDI report is that a low carbon growth path could deliver an average GDP growth rate of 6% annually until 2045. Through the sustainable utilization of its natural resources, and by reducing its carbon and energy intensity, Indonesia's total GHG emissions could fall by nearly 43% by 2030. This surpasses Indonesia's target in its national climate action plan, or Nationally Determined Contribution (NDC), presently set at 41% below baseline. In these scenarios, forested land is also predicted to expand, while fish stocks should remain stable, and peat degradation largely avoided. Investments totaling between US\$ 14.6 billion to US\$ 22.0 billion per year for the period 2020-2024, are required to realize such improvements. This is equivalent to between 1 and 1.7% of GDP: it compares well to Gross Fixed Capital Formation, which has been in the order of 30% of GDP over the last ten years.

4.3 Guatemala: climate change

The development of natural capital accounts in Guatemala have been useful for understanding the impact of the economy on the environment and the contribution of the environment to the economy, as well as identifying opportunities for innovation and promoting activities that could lead to sustainable economic growth. From a macroeconomic

¹³ Pilot Ecosystem Account for Indonesian Peatlands Sumatera and Kalimantan Islands
https://www.wavespartnership.org/sites/waves/files/documents/02_Peatland%20Account%20Dev%204_CMYK_low.pdf

perspective, the accounts were useful for sending signals to decision makers about the need to reduce the negative externalities and promote green growth. These accounts helped inform the national development plan and the competitiveness strategies which are part of the current discussions in the country (Castaneda et al. 2019).

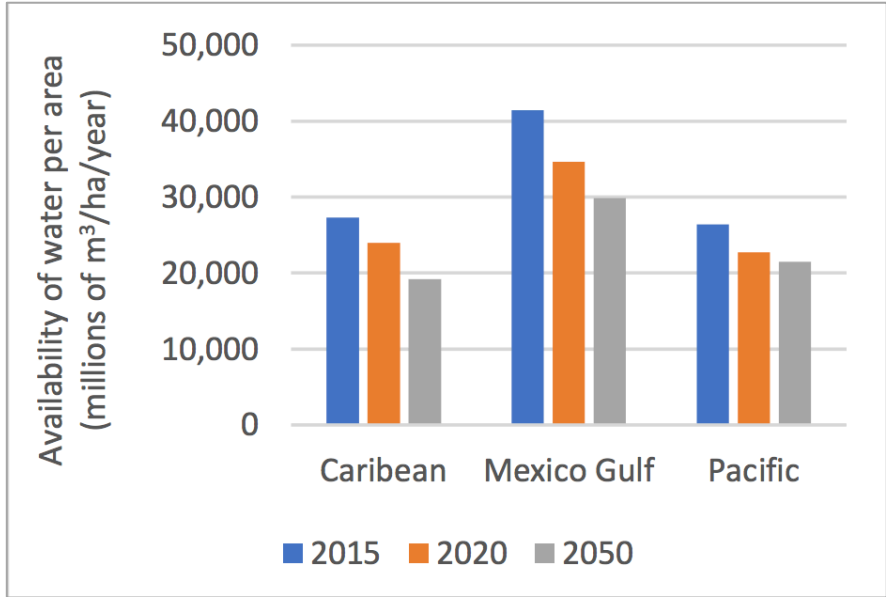
For ILM, Guatemala’s agriculture and environment accounts provided more elements for strategic decisions on issues of food security and sovereignty, critical for future development and poverty reduction and are a primary concern of the National Development Plan. As part of this work ecosystem accounts were developed and covered all of the country, including the Rainforests of Petén-Veracruz and Pine-Oak forests of Central América, that respectively represented 44 and 27 percent of the country’s area. The ecosystem accounts were useful for deepening the analysis of strategic natural capital to meet priorities of economic and social policy response, including enhancing tourism potential and addressing the threats from climate change.

For climate change the accounts provided the basis for a forward-looking perspective and useful information for apprising at least four of the six lines of adaptation considered by the National Action Plan on Climate Change, namely:

1. Agriculture, livestock and food security;
2. Forest resources, ecosystems and protected areas;
3. Integrated water resources management; and
4. Marine coastal zones.

The strategic objective of the National Action Plan on Climate Change is to guide the actions of public institutions with the purpose of reducing the vulnerability of the country to climate change, preventing and reducing its negative effects, prioritizing the protection of the vulnerable population and their livelihoods, and, identifying opportunities for a better development of the country.

Figure 4.3 Forecast availability of water under climate change scenarios for three ecological zones of Guatemala.



As an example of the information that the accounts can provide to inform actions to address climate change, Figure 4.3 shows climate change scenarios for the availability of water in the future for three different years in Guatemala, for three different ecological zone within the country. The modelling based on the accounts shows declining water availability across all

areas and enables national and local agencies to plan for reduced levels of water and assess development options. For the later, options that use less water would be preferred but this needs to be balanced against the need for food security within the country.

The fundamental drivers of climate change are, of course, greenhouse gas emissions and the main source of energy in Guatemala was fuelwood. The total human contribution of greenhouse gas emissions (GHG) from the combustion of different energy sources in Guatemala accounted for 45.6 million carbon dioxide metric tons equivalent.

Climate change is also related to forests extent and condition and this also related to fuelwood extraction from forests. The forest accounts showed: that 40% of forest cover was lost between 1970 to 2005. Nine out fourteen ecoregions in Guatemala were severely fragmented to a point where their integrity and provisions of natural goods and services can no longer be guaranteed. Agricultural areas expended at the expense of forests. Economic costs regarding degradation, such as the ability of forests to control erosion and their capacity to store carbon, were equivalent to Q2,919.4 million (~US\$374.3 million) between 1991 and 2003.

A key finding of Guatemala's forest accounts was that over 95% of this deforestation happened outside the control of government institutions and the analysis of the accounts showed that the impact of the harvest of fuelwood on the forest was greater than previously thought. Balanced against the loss of forest was the contribution of forest products to the national economy which was 3.15% and 2.57% of GDP for the years 2001 and 2006, respectively.

The accounting work in Guatemala has been recognized in by number of government agencies and their policy documents:

- The Ministry of Public Finances Environmental Fiscal Strategy 2018 Establishes strategic lines for the implementation of incentives and taxes to reduce and manage environmental impacts¹⁴.
- Ministry of Environment and Natural Resources Environmental use accounts in the report of the State of Guatemala for monitoring and evaluation of the situation and environmental trends in Guatemala¹⁵ and in the Base Document of the environmental pact in Guatemala 2016-2020 to propose the general guidelines for the achievement of an environmental pact in Guatemala, considering the public sector, private sector and civil society¹⁶.
- The Climate Change Science System First used the accounts in the report on climate change knowledge assessment in Guatemala. The report systematizes the climate change knowledge of Guatemala and uses this to assess the probable repercussions for the country¹⁷.

4.4 Rwanda: integrating land and water management in catchment planning

Rwanda is one of the most densely populated African countries, with an area of 26,338 km² and a population of about 12 million. Considering that the country has few natural resources to exploit and that its population largely relies on small, semi-subsistence rain-fed agriculture, land is already a constraint to agricultural growth. This means that to achieve

¹⁴ <http://www.minfin.gob.gt/index.php/acuerdos-ministeriales/2-uncategorised/3502-estrategia-fiscal-verde>

¹⁵ <http://www.marn.gob.gt/Multimedios/8879.pdf>

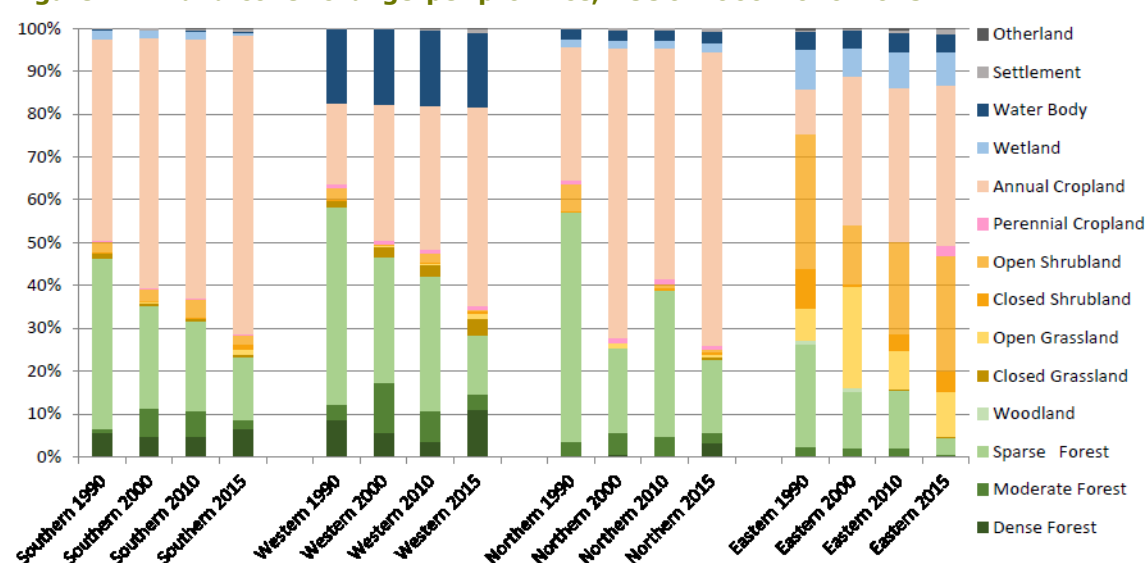
¹⁶ <http://www.marn.gob.gt/Multimedios/2547.pdf>

¹⁷ https://icc.org.gt/wp-content/uploads/2018/06/Infor_reporte_ESP_2018-05-28.pdf

food security, agricultural productivity must be increased. However, the high population density leads to plot fragmentation, land scarcity, and land degradation. As the country is now implementing its green growth strategy, the zoning of green areas is another high priority.

Rwanda has been developing NCA as a tool to enhance the sustainable management of the environment and natural resources. The NCA work began with land¹⁸ and water¹⁹ accounts, with some preliminary work on minerals. These three sectors are identified as the key pillars of economic development and sustainable growth in Rwanda. The information from the land accounts (Figure 4.4), published in 2018, shows that from 1990 to 2015 on national level forest and woodland areas have decreased and agricultural areas have increased. This development seems to be most dramatic in the Western Province, where the area covered by forest and woodland has more than halved, while the agricultural area more than doubled.

Figure 4.4: Land cover change per province, 1990-2000-2010-2015



Source: NISR Rwanda land account, 2018

Even though Rwanda is a naturally water-rich country and its resources include a dense system of lakes, rivers, marshlands, ground water and soil water, these resources are also under pressure due to population growth, intensification of agriculture, rapid urbanization, industrialization and climate change coupled with more weather extremes, adding to soil erosion, degradation and sedimentation.

The effects of the described changes in forested and agricultural areas were analyzed following SEAA EA guidelines by combining maps from the land account with precipitation and watershed information from the recently published (2019) water account. This provided insight in changes in various ecosystem services. During the 1990-2015 period the average quick flow runoff increased by 35%, potentially indicating flooding and water quality problems. The analyses also showed that the landcover changes initiated an increasing sediment flow into waterbodies, a development most pronounced in the Western Province,

¹⁸

http://www.minirena.gov.rw/fileadmin/Media_Center/Documents/RW_NCA_Land_Account_March_2018_IV_1.pdf

¹⁹

https://www.wavespartnership.org/sites/waves/files/kc/18_Mar_2019_RW%20NCA%20Water%20Account_Final.pdf

impacting productivity of ongoing agricultural activities and posing increased risks to horticultural investment programs being developed in the region.

In order to tackle these challenges, the government, supported by various partners, has proposed catchment planning, a common instrument to promote integrated water resource management. The plan set up for the Sebeya catchment, located in the affected Western Province, is one of the first to be implemented in a truly participatory manner in Rwanda²⁰. 30 years ago, most of Sebeya catchment was covered in dense natural forest. Due to population pressure, however, people have cut the forest and started cultivating the deforested areas. The nature of the topography, with many steep slopes, combined with open land and bare soil where forest used to be, means that the catchment is now prone to high levels of soil erosion, lower rates of groundwater infiltration and faster runoff. Devastating floods in the lower parts of the catchment and highly sediment rich rivers and watercourses have been the consequences.

First emergency restoration measures already resulted in reduced erosion and reduced flooding in downstream areas. As a foundation for the catchment plan, stakeholders formulated a shared vision, stating that “a well-managed catchment is home to prosperous communities, living in harmony with nature and drawing social and economic benefits from water and environmental resources”. The overall agreed objective was to “effectively manage land, water, and related natural resources, to contribute to sustainable socio-economic development and improved livelihoods, taking into consideration environmental flow, downstream water demands and resilience to climate change, and minimize water related disasters”. Catchment restoration work, including reforestation of highest risk areas combined with terracing and climate smart agriculture practices, will allow farmers to continue farming in the Sebeya catchment without causing further soil erosion and rapid runoff.

Many innovations were involved in developing both the process and the content. A Strategic Environmental Assessment (SEA) was performed and inter-district collaboration around natural resources was promoted, by establishing a catchment task force comprising of district vice mayors, district technical staff, and representatives of NGOs, National Women Council, and Private Sector Federation. With respect to data innovations, the water monitoring systems were rehabilitated and further developed to provide more and better information to support catchment planning and operational IWRM in the future. Also catchment restoration opportunities maps (CROM) and a decision support system has been developed, using the national land use and cover data, also relevant for the NCA land and water accounts.

4.5 Netherlands: supporting integrated landscape planning

Each spatial planning strategy in the Netherlands is a product of its time, followed and adjusted as necessary to the political, economic and societal context. In the 1980s, the Netherlands could be considered a welfare state with a centralized spatial planning system supported by ‘hard’ (financial and regulation) instruments gradually transformed into a decentralized planning system with ‘soft’ (guidelines and stewardship) planning instruments.

Today, the Dutch spatial planning policies have mostly been decentralized. With the exception of cultural heritage, Natura 2000 and the National Ecological Network, policies are

²⁰ <https://waterportal.rwfa.rw/node/3135>

deregulated and managed by individual provincial and municipal authorities. Decision making on the extensions of natural areas and the way they will be developed and designed were also delegated to the provinces.

Figure 4.5: Exploring landscape level choices towards a high value living environment

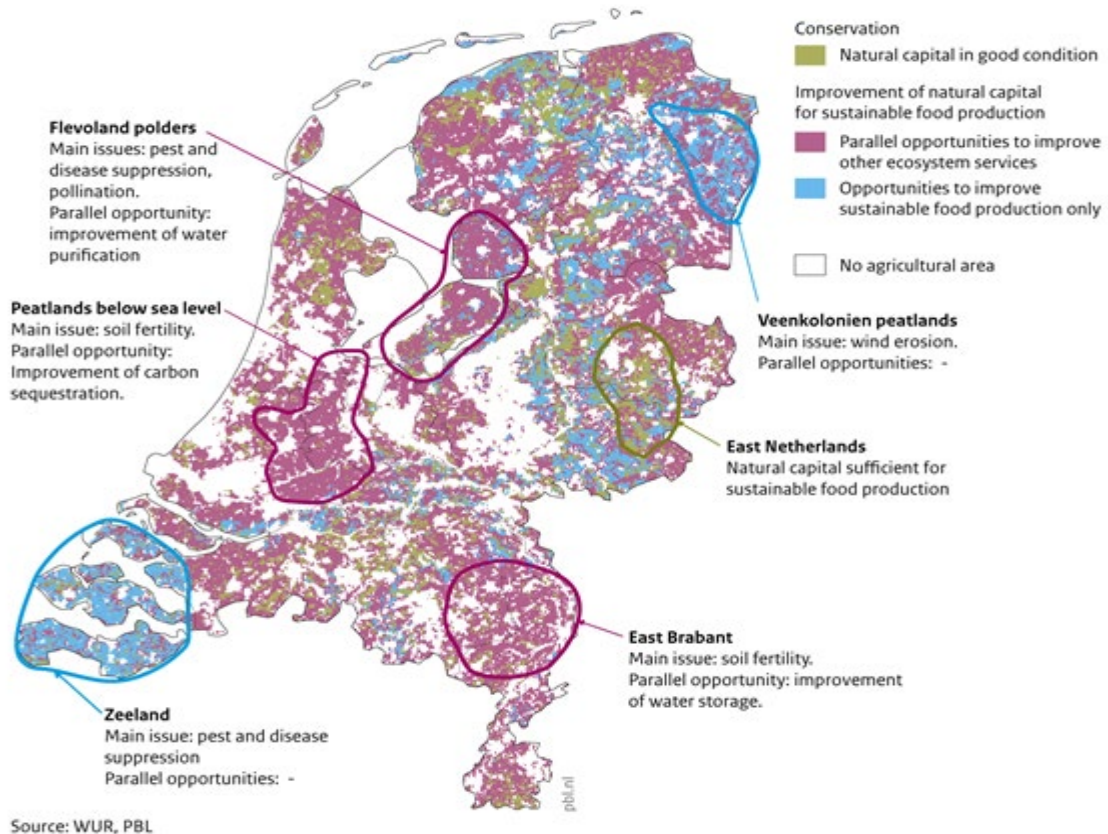


Responsibility for the environment is covered by environmental legislation that is scattered over numerous other laws at different levels of government. This scattering of legislation gives rise to disagreements and coordination issues. To simplify this situation the national government is currently working on the new Environment and Planning Act (expected to enter into force in 2021) and National Environmental & Planning Vision. The Environment and Planning Act defines how the spatial plans of the national government, provinces and municipalities are to be coordinated and interlinked, promoting more and more an ILM type of approach to planning.

To support this the new Act seeks to modernize, harmonize and simplify currently distributed rules and integrate them into one legal framework. Land-use planning, environmental protection, nature conservation, construction of buildings, protection of cultural heritage, water management, urban and rural redevelopment, development of major public and private works and mining and earth removal will all be brought under one act. The landscape level is considered an important scale for planning and negotiation on spatial developments. Seeing landscape as a common good is positive, but also creates uncertainty about who is responsible for it. An important strategic question is: how can the values of the natural capital be maintained and sustainably utilized?

To support planning and decision making the development of the online Atlas Natural Capital was initiated, containing information about natural capital and ecosystem services. Following the decentralization of policies, in 2016 the spatial resolution of the information was improved to support regional and local planning. For this Statistics Netherlands (CBS 2018; Remme et al., 2017) developed a range of biophysical ecosystem service supply-use accounts, following the SEAA Experimental Ecosystem Accounting guidelines.

Figure 4.6: Challenges identified by selected landscapes for conservation and improvement of natural capital supporting sustainable food production, 2016



These accounts showed that the supply of ecosystem services varies, depending on the availability and condition of the ecosystem. Also demand for services varies per region. Based on this various landscapes and provinces have explored planning strategies that promote sustainable food production in line their natural capital, the main outcomes are shown in Figure 4.6. On the one hand these strategies are aimed to promote the sustainable use and protection of existing natural capital, like a healthy soil and natural agricultural field margins. On the other hand, they are aimed at increasing the use of natural capital by improving ecosystem services focusing on pest control, pollination, erosion control and soil fertility. Local projects were setup by public, private and civil society actors to realize this ambition. Potential synergies derived from this for other stakeholders in the landscapes where also assessed to promote a multi-functional planning approach, which is in line with the intention of the new landscape and stakeholder oriented spatial planning framework.

5 Connecting ILM and NCA processes

The ILM and NCA processes have come together in only a few places in the world, so understanding between these two communities is only just beginning. While interaction is still in its infancy, the work that has been done is encouraging and has demonstrated that accounts can be produced and decision makers at various levels can see several opportunities for use of NCA in ILM.

Below we report on interviews of people who are either experts in ILM, NCA or ideally both. They were asked to reflect on: what ILM and NCA are; how the two might benefit from closer interactions; how such interactions can be set-up to design and produce accounts and, finally; to maximize the possible uses of NCA in ILM.

5.1 Expert views on connecting ILM and NCA

Interviews of people connected to ILM and NCA were conducted to gain insights on how the two communities could be better connected. A wide variety of information and views were obtained from those interviewed²¹. The following questions were posed to all:

- Are you aware of natural capital accounts that have been designed for use in landscape level decision making, or, vice versa, landscape management decision making that has been informed or could be, by natural capital accounts? If not accounts, then what about account-like data (e.g. on ecosystem services)
- What benefits do you think are possible if natural capital accounting and integrated landscape management were brought together in countries?
- What can be done to bring natural capital accounting and integrated landscape management closer together?
- What practically needs to happen for natural capital accounting and integrated landscape management to be developed and used in countries?

Below we discuss the information from the interviews and provide some specific quotes under the headings: Awareness of NCA in the ILM community; Benefits from bringing natural capital accounting and integrated landscape management closer together in countries, and; How to bring natural capital accounting and integrated landscape management closer together.

Awareness of NCA in the ILM community – A key issue is that the concept and products of NCA in general are not well-known, if at all, by many people in the ILM community. For example, a senior representative from a global NGO said:

²¹ The interviews were conducted over the internet. Potential interviewees were identified by the authors and members of the Organizing Committee of 4th Policy Forum. The people identified were contacted via email with information about the 4th Policy Forum and its focus on ILM. In some cases, those initially identified referred the request for interview to others within their organization or area of expertise.

After agreeing to be interviewed, a two-page briefing, covering basic information on both ILM and NCA, was supplied along with some general questions to prompt thinking ahead of the interview. 12 people have been interviewed. Annex 1 (Section 8) of this document contains the briefing note and questions.

"I see NCA as a means to an end. And in that framing, like the use of NCA and national level accounting and economic planning makes a ton of sense to me on a conceptual level. But the use of it at a landscape level, I can see how it can be valuable in some cases, but it's not obvious to me that it's the most important thing or that it would be all that relevant in other cases."

And similarly:

"As part of the work we're doing on landscape progress monitoring, we have been doing a lot of scoping about the different methodologies and metrics that are used to document different aspects of sustainability within landscapes. And I would say we haven't come across that [NCA].

Besides the limited awareness, there is a view that NCA was mainly about economics and putting a price on nature and biodiversity. For example, another senior representative from a global NGO with an extensive research background in agricultural economics said:

"...there's the social value versus the financial value of something, and that's very central to the natural capital world . . . we see that biodiversity actually delivers all of these incredible benefits to people, but they're not benefits that can be monetized"

Access to and understanding the NCA data is also sometimes a barrier, for example for private sector actors, as noted by a senior strategic officer from an international financial institution:

" . . . what I feel from the private sector is they'd like to have data that is more conducive to their uses and that they can access more easily. A lot of the natural capital data that say, in Colombia with the work we did there, was difficult for a company to figure out what to do with that data or if they could even access that data."

Using different languages to talk about the same topics might also be a challenge in bringing these communities closer together, as put by a senior conservation finance expert:

"All of these things are very good. Problem is that none of them talk to each other. And the challenge now is to find a common gauge where all of these different systems for the finance world, for the corporate world, for the government, etc., where they could all travel between each other's worlds"

While the answers to the first interview question confirmed that there was very little knowledge of NCA and its use in the ILM community and vice versa, it also showed that much of the activities and research that is undertaken in ILM can be related to accounting, such as work on ecosystem services and modelling. To quote from a senior government research economist:

"I had never heard the term ILM, so I went to that eco agriculture partners document which had a page of synonyms and related terms and I'm familiar with quite a few of those . . . having a background in ecology and being a very regular user of GIS it intuitively makes a lot of sense. And doing anything aside from ILM seems really haphazard and piecemeal, a.k.a. ineffective . . . so it it's an intuitive approach to me. I just wasn't familiar with the term and a lot of my past research outside of the accounting world has been about how do we do landscape scale modelling and mapping that could support decision making. So, I think it's a pretty good fit for integrated landscape management."

Bringing environmental information into monitoring frameworks that assess broad landscape development, is clearly a desire in the landscape community and several interviewees touch upon this shared ambition with NCA. As one interviewee put it:

"If there is a distinction between natural capital accounting as it's being defined here and a systematic indicator sat around landscape performance? Because if they're the same, then I would say yes, there are a variety of landscape sustainability indicators sets."

There was also recognition that things have changed in recent years. As one interviewee said:

"I had a lot of interaction with natural capital people . . . quite some time ago. And then I've dipped into it every few years. And to tell you the truth, for the longest time, I was intensely frustrated because all the natural capital modelling work was using this incredibly simplistic accounting standard for looking at agricultural lands. And in many of the early years, they would actually mark agricultural lands as having zero ecosystem service value. I think that's changed in the last five years"

Benefits from bringing natural capital accounting and integrated landscape

management closer together in countries – While a diverse range of benefits were identified as possible, a key one was simply identifying the data that are available and could be used for ILM with or without the construction of NCA. Not knowing all about or having access to data is a common issue. Gaining and enabling on-going access to data, as well as the models and assumptions behind them is a critical issue, as noted by a senior government researcher involved in the production of accounts:

"As a more general goal and something that's very near and dear to my heart, the data needs to be kept open, transparent and easy to use. Which isn't always the case, but that to me is the broader prerequisite of how we design and manage the data."

Another issue was different data sources giving different answers. As one interviewee noted:

"We cannot get data from different sources that actually replicates the data from each other . . . So it's interesting. It's a challenge

Even when data were made available and accounts produced, it was often at scales which were not helpful for local level planning or for business. As one business sector representative noted:

"It seems daft that we've also got national natural capital accounts which are being developed with whole teams looking at gathering data and gathering spatial information. And yet the businesses feel like they can't really either get to that data or use it because it's so big, so clunky. It so also spatially irrelevant. The granularity is just useless to them because it's so aggregated."

Interviewees also recognized that in data poor environments, data from NCA might be the best available, though still acknowledging its limitations, as noted by a senior researcher at a global conservation NGO:

"...I think one thing that the community is not really appreciating, or you don't see a whole lot of discussion is that in some cases the accounts are on and off themselves. They're not sufficient for the types of planning at the landscape level. In some cases, when you are looking to a landscape and you really want to monitor changes [of] the forest cover over time, then the accounts are basically it"

But when official detailed accounts are available, the opportunity of being able to make development plans more coherent, between sectors and levels, was mentioned by a government official:

"The account[s] can help is if you know what the total balance is, You can put two plans next to each other and see how does the data add up then how does it fit with

the big plan and where do we need to tweak. Either make the lower plans more ambitious to actually be able to achieve the big plan or lower the expectations at a higher level.”

The difference starting points of ILM and NCA were noted, including by environmental scientist now working for a business group who said:

“ . . . natural capital accounting seems to be focused around delivering a product. Which is really impressive, solid, technically accurate accounts, whereas integrated landscape management is more of a process and more about engaging people and figuring out the significance of things and the consequence of things.”

The statement highlighted the need to recognize the differences and the need to demonstrate to benefits of linking the two. In this, some real examples of benefits were noted. For example, a government official working from an embassy in Africa that is an expert on integrated water-management, spoke about a specific project that highlighted the potential link between ILM and NCA:

“There were some interesting things happening and that link the two. We recently had an assessment done in preparation of the establishment of the Water Resources Board. This assessment started from the premise that if [country] wants to reach its economics goals that is has set, the water requirements to get there are in the range of 50 percent of total renewable water, and this requires massive inter-basin transfer of water and massive storage for the dry season. . . the water availability targets were put next to the economic growth targets and the implications were reviewed. One implication is that there's just not the money to build the dams. So we need to look at alternative ways of getting to the economic growth targets. I think that's a really useful example of how NCA can inform decision making”

Similarly, a proponent for the development of accounts in a provincial jurisdiction noted:

“it seemed to me that we needed a way to be trying to get the message to Treasury in a way that they understood. . . . I think that the accounts really can speak to Treasury. I don't think we've got as good at that as we could be without the central banks that, say, Costa Rica and others have. That makes a real difference. Getting to Treasury was one of the things that I thought was probably going to be opened up to us if we were able to do more in terms of accounting.”

On the way forward, having real examples where identified are vital. As one interviewee said:

“There have to be demonstrations of why blending these approaches would be useful. And how it would help decision making. And that's maybe a space for donors to say, hey, here's a country that has some pressing natural resource issues. They've got a government and a civil society that's really interested in working together. And they've got solid accounts and solid data. Let's make it happen.”

A similar sentiment came from another interviewee:

“I think it could be a really interesting experiment for a set of pilot landscapes and take input data and run an NCA type model and see what happens and see whether that information is somehow a lot more salient to the decision makers.”

And further encouraging that:

“...if NCA can help formulate information in a way that increases the likelihood that those actors will [...] institute more sustainable land use plans that are putting agriculture and development in appropriate places and are conserving natural

ecosystems and land based carbon and rights of indigenous peoples and things like that, then by all means”

It was noted that for NCA and ILM to be used they needed to be trusted and processes needed to be established to ensure this. As noted by a very senior government decision maker:

“Setting up a quality assurance framework would lead to better natural capital accounts data produced. For example, we have the Technical Working Groups (TWGs) made up of key stakeholders (sectoral agencies, finance ministry and statistics agency) that work together regularly to develop, quality check and approve the accounts findings/accounts before the senior government officials meet in the National Steering Committee to provide guidance and approve the NC accounts work towards publication by the statistics office. It is important to focus on the quality of data and priority questions to inform policies and decision-making process.”

How to bring natural capital accounting and integrated landscape management closer together – The process for bringing the ILM and NCA communities closer was a challenge, this had seldom happened and the 4th Policy Forum is perhaps the first genuine attempt at this, at the international level at least. As such the focus of the 4th Policy Forum on ILM by itself had initiated discussions. A challenge is to ensure that the two communities keep talking and that something happens after the forum. For this, a practical approach is needed and the development of accounts for particular areas and problems would provide a reason to keep talking.

A point made by several interviewees was that if NCA was to be used for ILM, then the intended use would have to be well defined and that account design and construction should be based on user needs. In this it was seen as important that the publication of the accounts is not seen as end point but rather as a key point where the potential users become the actual users who then provide feedback to the producers to make the accounts better.

To ensure this, a suitable process would have to be established. In general, two important roles had to be allocated: the first was outlining the problem and steering the process of account design, development and use and the second was the technical construction of the accounts. For both tasks high-level support was needed from the organizations that would use and produce the account. This support was needed to provide the platform for collaboration between agencies as well as the reasons, resources and encouragement needed for account production. At the technical level, such support was needed, especially to access and share existing data, as well as to generate new data (e.g. from additional surveys of farmers) or develop new models for estimating missing data. The general experience of WAVES Partnership countries was that a high-level steering committee was established, led by an agency, usually a central agency (e.g. national planning department) that could use the accounts.

Leadership from the user side was stressed as important by several, including a senior government official responsible for environmental reporting who said:

“ . . . the lead should be a policy agency. I think that you need good facilitation. And I don't think you're going to get that necessarily from a data agency. Now, that's not always going to be the case. It might be just too blunt a comment. But I think the whole thing needs to be properly facilitated. And by that, I also mean you don't want somebody who you pay to come in and do the facilitation. You need somebody who knows what they're doing and who knows what the aspiration is, knows what the goal is, and intends to work the meetings to get to it. So it needs to be the final user of the material and I think that's the policy agency.”

In this, it was also noted by several interviewees that the NCA and related technical analysis was an input to decision making and the actual decisions had to be made by people. As one interviewee noted:

“We should not be optimizing a natural capital account analysis in order to decide what you're going to do in the landscape. I think those things need to be negotiated by people in the landscape, but they need to understand what it is they're negotiating away”

in response to a question on how to get started and addressing different audiences, a senior government official responsible for environmental reporting said:

“In my view, narrative and storytelling. And it sounds really trite, but when you look at what happens with some ministers, you know that they will pick up an issue and run with it because of interest and because of who's raised with them and because it's an issue they care about when they might not be the central bank economist who's got an overarching view of the whole gamut of policy across a jurisdiction”

This person went on to say that the accounts needed to address “squeaky wheels” – that is the issues generating public and political interest.

In addition to carefully defining the possible use of accounts, the areas for the decision making and hence the data needed for these areas was a critical. As observed by one interviewee:

“One challenge here is one of scale and boundary delineation. So, if you're talking about a framework that tries to take these disparate social and environmental dimensions and resolve them down to a more standardized or distilled metric like one around economic valuation. Probably that approach has the most value if it's directly linked to a jurisdictional scale where there is a policymaking entity that would be poised to make decisions based on that information”

and furthermore,

“...when it comes to a landscape, landscapes can be defined according to different boundaries and those can be jurisdictional, but they're often not jurisdictional. . . . even where they are jurisdictional, it's not clear that the jurisdictional authorities would be the ones for whom that metric would be the most salient one.”

The SDGs and National Development Plans were noted as possible entrée for ILM and NCA. As noted by one senior NGO representative:

“[we need to] have the NCA work with SDGs and look at places like Colombia that is both committed to integrating the SDGs and has lots of integrated landscape management places that would be a valuable place”

Scale and need to bring local and national process together as was another theme. As noted by a development official working on projects in an African country:

“I think we need to find a way to bring the national and the local planning process together. I'm not too sure how to do that. One very strong thing here is there is a vision 2050 and the targets are there, and everyone works towards them. That's, I think, a really good thing. But then you need to translate that locally and that translation is a challenge. I can imagine indeed, that if you want to do a local planning with land accounts, you want to be able to calculate what the impact of the

intervention will be on the accounts, but also have the information from the accounts sufficiently localized to help you make the calculation.”

Many saw the accounts as way of assisting communication with financiers and of providing some trusted information and means of communication. For example, one interviewee noted:

“There are a few lenders out there that are interested in directing finance and capital to sustainability-oriented land projects, whether that's restoration or regenerative agriculture. But they need to know something about the risk of those investments. There is definitely still a dearth of trusted information on landscape sustainability performance for use in decision making.”

On the financing, a very senior government decision-maker noted:

“The funding mobilization would start with integrating the NCA work activities in the national budgeting processes for both concerned sectoral and statistics agencies. Then also consider development partners with interest/initiatives in the NCA work and sustainable land management development processes.”

In this communication between government and business was essential. As a representative from the business sector noted:

“If business is going to do anything scalable, it needs policy behind it. But also if policymakers want the policy to be taken out and understood and supported, they're going to need businesses involved as well. So it's a classic kind of trying to bring two to communities together”

5.2 Connecting NCA and ILM via the landscape policy cycle

The policy cycle has been used as a way of linking accounting to decision making (Vardon et al. 2016). A version of this cycle and its connection to integrated land management is presented in Figure 5.1. The material in Fig 5.1 is information from the previous sections including the interviews of people involved in ILM and NCA (see Annex 1 list of people interviewed).

Problem identification – The work to date indicates that NCA has a key role in identifying problems and especially for spatially locating existing problems. In this, the maps of accounting data were particularly useful for communicating to decision makers where the problems were. The accounts, when coupled with appropriate modelling, were also useful predicting where problems might be in the future.

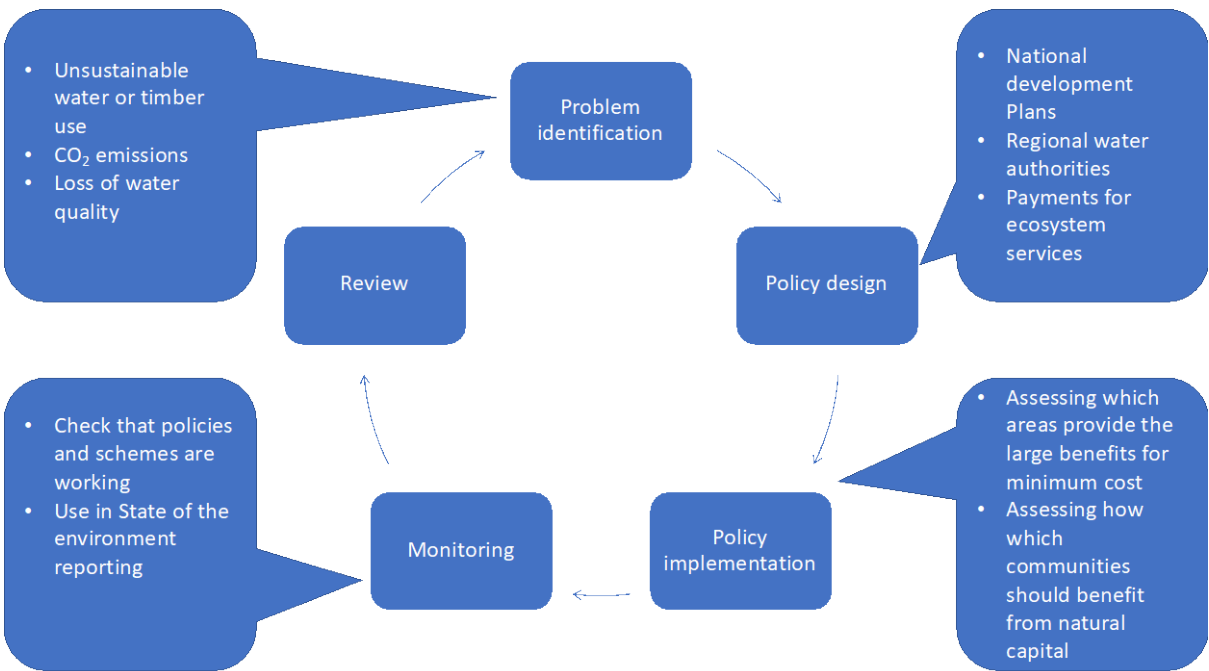
Policy design – While accounts have not yet been used specifically to design interventions at the landscape scale, their use in modelling and other analysis has been used to show existing trade-offs. For example, in the management of watersheds used for water supply and exploring how changing levels of forest cover could cause changes in the amount and quality of the water available for use. Such information could then feed into new policy instruments, such as payments for ecosystem services and restoration, or for encouraging the finance sector to examine the broader benefits and risks to investments in major infrastructure projects

Policy implementation – A potential revealed by the experience to today is that accounting can be used to identify particular places and communities that could benefit from a more efficient targeting of existing policies. In this, the accounts can be used to spatially select the areas and communities where the interventions are most needed. This could be the poorest

communities or for the areas either at most risk of degradation or that would deliver the greatest and multifunctional benefits from the least investments (i.e. the low hanging fruit).

Monitoring and review – Consistently this area is identified as the key benefit of accounting. Having integrated environmental and economic data presented regularly and consistently would be a significant advance and valuable to national governments, regional authorities, local landowners and financiers. Having the information from the accounts enables regular discussions between the different stakeholders and also helps to redresses the power imbalances between national and local stakeholders. Also the regular production of the accounts leads to improvements in data availability and quality as well as increasing the trust in the accounts at all levels (local to national).

Figure 5.1 Draft. How NCA can inform integrated landscape management in the policy cycle



6 Going forward

The development of ILM and the experience with NCA, and land and ecosystem accounting in particular, around the world has demonstrated that structuring information in the form of accounts reveals interactions between human activities and ecosystems, and how they impact on the levels of ecosystem services used as well as the extent and condition of ecosystem assets (e.g. Vardon et al., 2019; etc.). The work has clearly shown that accounts can provide policy-relevant information (e.g. Bass et al., 2017; Ruijs and Vardon, 2018) and some general issues for discussion are listed in Box 6.1.

Box 6.1 Issues for discussion for better integration of ILM and NCA

Data coverage and quality mismatch – Data access and data quality are recurring issues for both ILM and NCA. What are the key datasets needed for ILM and NCA?

Boundary selection – The management areas of ILM seldom directly match the data output area available. How best to select the policy boundaries and then to match these to the data available?

Landscape-level decision-making criteria – what approaches, like ‘carrying capacity’, ‘catchment planning’ and ‘social value’, are paramount for ILM and how can NCA best serve them?

Institutional reform – how can ILM and NCA together shift institutional set-ups from silos to synergies, from overly-centralized to usefully decentralized?

Inclusion – can NCA and ILM work together to reduce the risk of entrenching top-down approaches? How can better landscape level data put power in local stakeholders hands to ensure ILM is equitable?

Pilots – what scope for pilot joint ILM/NCA work that would address the above?

Before moving to general lessons from the work examined, we need to recognize that a significant barrier to use of NCA, particularly in the conservation community, has been the misunderstanding that NCA, and in particular accounting for ecosystems, is an attempt to value everything and is “the commodification of nature” and hence part of the dominant economic paradigm that has caused the problems (e.g. Monbiot, 2014). Others argue that if ecosystems are not valued then they are effectively given a zero value, and hence always be secondary to economic values (e.g. Schröter et al., 2014).

That noted, on the basis of the examples discussed in this document as well as examples presented in previous Policy Forums and elsewhere, a wide range of developed and developing countries have produced and applied accounts, at least some degree, to integrated land management. A range of valuable insights and lessons for integrating ILM and NCA are summarized in Table 6.1 which looks at: the processes and governance; data sources and methods; challenges in construction; funding and finance; communication, and; potential and challenges in the policy cycle and decision making.

The applications span broad themes, such as the SDGs, natural capital and ecosystem services, through to major topics such as climate change and biodiversity conservation. Management of land for the provision of particular natural resource is also apparent for water and timber non-timber forest products (e.g. fuelwood, honey) in specific areas, where there is sometimes competing land uses. Ecosystem services are often mapped to assess trade-offs of certain policies, though they are usually not in formal accounts. Furthermore, for many landscape initiatives basic information describing the characteristics of the landscape and trends on land use and water use are often lacking. While it is not yet demonstrated it seems possible that top-down NCA and national or sectoral level policies can be linked to bottom-up NCA and applied at the landscape level.

In this, while there is work demonstrating potential, the actual use of accounts in landscape level management has been limited to date. A key reason for this has been a lack of understanding of accounts and accounting on the part of decision makers involved in land management. Workshops to introduce decision makers to NCA prior to their release have been effective (e.g. in Australia) as well as linking the accounts to forecasts of what might change under different management scenarios (e.g. in Indonesia).

In this, exploring and scenarios, spatial modelling using NCA can help to increase awareness among stakeholders about landscape dynamics and the relative importance of different drivers of landscape change, such as a growing population and increasing urbanization, the expansion of agricultural production and the development of infrastructure and mining. Indeed, modelling of alternative future scenarios can be a catalyst for building landscape partnerships, and for bringing to the surface and refining stakeholder assumptions, analyses, and negotiations around strategy, production and resource management practices and spatial planning

This brings us to a key consideration: getting accounts used means getting them trusted by decision makers. Greater understanding certainly assists this but this also needs to be complemented by process for assuring the quality of accounts. The accounting recognizes that while there may be discrepancies between different data sources as well as data gaps, government and business must continually make decisions. Statistical agencies recognize the six dimensions of data quality – relevance, accuracy, timeliness, accessibility, interpretability and coherence. In individual data sources the focus is mostly on accuracy (i.e. closeness of estimate to the real number) but accounting addresses all of the six dimensions and has particular strengths in timeliness, accessibility, interpretability and coherence, providing data when it is needed in a consistent format. Over time both the accounts and underlying data improve (Vardon et al. 2018).

Table 6.1: Summary of insights and lessons for integrating ILM and NCA in decision making

Category	ILM perspective	NCA perspective	Reinforcing ILM & NCA
Process and governance	<ul style="list-style-type: none"> (1) Complexity (and inclusivity) increases with the number of stakeholders, (2) Small areas, not always aligning with jurisdictional boundaries (3) managing multi-stakeholder relations is quite a challenge. 	<ul style="list-style-type: none"> (1) Need a process to bring the different data holders together. (2) Need formal arrangements for sharing data (3) High-level agreements between agencies on data sharing and data use (4) Account users need to be involved in account design and construction 	<ul style="list-style-type: none"> (1) Senior representative of key stakeholders in the ILM and NCA communities need to be brought together as early as possible (2) Need to form a high-level strategic body as well as technical groups that cover both construction and use of accounts (3) Production of the first accounts is not the end point
Data and methods (information needed)	<ul style="list-style-type: none"> (1) ILM can be seen as a process that needs to be fed by data and analysis (2) A more standardized approach to ILM data needs would likely assist with implementation (3) Require data and methods that focus on multifunctional uses (like mosaics, agroforestry) 	<ul style="list-style-type: none"> (1) Data is scattered between different agencies (2) Data is usually missing (3) Models and assumptions are needed to the absence of complete data (4) Regional and local data are essential to ILM (5) Need GIS technology and expertise to produce ILM usable accounts 	<ul style="list-style-type: none"> (1) Need to accurately represent the quality of data in information products. (2) Need have data quality assessment processes in place (3) Need to continuously improve data sources for the accounts
Challenges in construction (or challenges in implementation)	<ul style="list-style-type: none"> (1) Challenge of integrating data originating from various administrative classifications (e.g. districts, watersheds, economic growth zones) (2) Often lacking socioeconomic data compared remote sensing derived data 	<ul style="list-style-type: none"> (1) Breaking down national level information to match regional or local area (2) Scaling up local data to match regional or national data (3) Spatially representing information creates issues with confidentiality (4) Gaining an understanding of ILM and decision-making terminology 	<ul style="list-style-type: none"> (1) Defining boundaries for NCA that align with ILM regions (2) Gaining common understanding of terminology between ILM and NCA communities (3) Need to produce NCA quickly to demonstrate usefulness to ILM community

Category	ILM perspective	NCA perspective	Reinforcing ILM & NCA
	(3) dealing with spillover effect beyond landscape boundaries		
Funding and finance	<p>(1) So far finance has been mentioned by a limited number of governments and international organizations and NGOs</p> <p>(2) Challenge of connecting large investors and funds to small landscape interventions</p> <p>(3) Strong link to sustainable finance and corporate social responsible activities</p>	<p>(1) So far finance has been mentioned by a limited number of governments and international organizations and NGOs</p>	<p>(1) Funding needs to be found for pilot studies of applying NCA to ILM</p> <p>(2) Funding by national governments and international agencies is important initially.</p> <p>(3) Funding can come from a range a international, national and local stakeholders and joint funding may increase commitment to on-going production and use of accounts</p>
Communication	<p>(1) ILM is not a well know term but the general concepts of it are recognized and understood by land managers</p> <p>(2) the concept is strong in illustrating interactions, either between activities in landscapes, or tradeoffs in SDGs</p>	<p>(1) NCA is not well understood and need to address this early in account production (2) Need a plan for communicating results to users and the general public</p> <p>(3) Diagrams, maps and charts work better than pages of tables</p>	<p>(1) Very important to identify the different audiences for NCA and ILM (2) Very important to be able to demonstrate the value of account production to the ILM community</p> <p>(3) Good examples are important</p> <p>(4) need to recognize the limits of data quality</p>
Potential in decision making (use in policy cycle)	<p>(1) So far mainly useful in the identification of issues, bringing stakeholders to the table, development and implementation of interventions at local level</p> <p>(2) Could be scaled up to be useful at higher levels (national and multi-country)</p>	<p>(1) So far mainly used in monitoring, review and problem identification at national level</p> <p>(2) Could be used at subnational levels and in other parts of the decision-making cycle with additional analysis and modelling could be used in policy design and implementation, mainly useful in the identification of issues, development and implementation of responses</p>	<p>(1) Monitor and review the sustainability of current land use and land management</p> <p>(2) Assess trade-offs between different management and investment decisions</p>

Category	ILM perspective	NCA perspective	Reinforcing ILM & NCA
	(3) Strengthen role as collective actor in achieving global goals for sustainable development		(3) Identify hotspots in need of land use and land management change (4) Can be applied to international agreements such as the SDGs and CBD
Challenges in policy cycle use	(1) ILM developed as a bottom up approach and national level (sectoral) policies could be more aware and supportive (2) Decision making at local level influenced by many factors including poverty, immigration and large government and non-government businesses involved in resource use	(1) Account producers are often statistical officers which deliberately do not extend into policy interpretation and analysis (2) Accounts are usually at the national level and hence need to be scaled down to be useful for ILM decisions	(1) Need to align international, national and sub-national decision-making processes and priorities (2) Information needs to be seen as important (3) information needs to be available when decisions are being made and hence ILM and NCA need to be "ahead of the game"

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Annex

Interview briefing note and questions sent

Background information and questions for the interview on ILM and NCA

Natural Capital Policy Forum 2019

Understanding and increasing the synergies from linking Integrated Landscape Management (ILM) and Natural Capital Accounting (NCA) is the main topic of the Natural Capital Policy Forum being organized by the World Bank and UN Statistics Division (UNSD) to be held on 17-18 November 2019 in Uganda²².

Examining how NCA can inform ILM, for example decisions on land use and ecosystem protection, is a key part of this. Providing a platform for sharing experiences between those working on ILM, NCA and associated data providers is another key part of the forum. The intent is to increase understanding of the policies aiming at improving landscape governance and management as well as the information needed for this.

Natural Capital Accounting

Natural capital accounting integrates natural resource and economic analysis, providing a broader picture of development progress than standard measures such as GDP (Gross Domestic Product).

Natural capital accounts are a set of objective data that show how natural resources contribute to the economy and how the economy effects natural resources. These accounts can provide detailed statistics for better management of the economy, such as accounts for the inputs of water, timber and energy as well as the outputs of pollution, that are needed to achieve green growth or to model green-growth scenarios. The use of ecosystem services by the economy and people are also important and are part of this.

The concept of accounting for natural capital has existed for more than 30 years. In 2012, the United Nations Statistical Commission adopted the System for Environmental and Economic Accounts (SEEA)²³. This system provides internationally agreed-upon concepts and methods for account production. Accounting for ecosystem services is relatively new, with an experimental framework published in 2014²⁴.

Connecting to Integrated Landscape Management

Spatial planning and land governance are becoming more and more important as cumulative pressures from the demands for food, feed, biofuels, nature conservation, and urban expansion, lead to increasing competition for natural resources and also have an impact on the flows of ecosystem services.

The actions that are required to achieve the 2030 sustainable development vision, defined by the Sustainable Development Goals, will need to be planned and implemented at both

²² <https://www.wavespartnership.org/en/forum-natural-capital-accounting-better-policy>

²³ <https://seea.un.org/content/seea-central-framework>

²⁴ <https://seea.un.org/ecosystem-accounting>

national and sub-national scales. At sub-national scales stakeholders are able to implement and more clearly understand the impact of specific actions. This follows the desire to holistically balance multiple goals related to both environmental and non-environmental processes, for example, livelihoods and sustainable resource management (Freeman et al., 2015). In conjunction with national and regional spatial planning, interactive and adaptable spatial and land-use-planning processes need a strong bottom-up component. Here the overlapping interests of a range of stakeholders can best be integrated within a multifunctional landscape (CBD, 2014; UNCCD, 2017).

A landscape is a socio-ecological system that is organised around a distinct ecological, historical, economic and socio-cultural identity²⁵. In a landscape approach, stakeholders aim to balance and reconcile competing social, economic and environmental objectives²⁶. Integrated Landscape Management (ILM) is the actual process that builds on a multi-stakeholder approach, combining and integrating sustainable use of the environmental resources with economic development²⁷.

In theory NCA could play a useful role in building the knowledge base required for successful ILM. In this, NCA would be bringing detailed an on-going information on the stocks, flows, quality and value of environmental resources such as water, soils, forests and biodiversity.

That being said, the explicit application of NCA in ILM seems limited so far. With the Policy Forum session, paper and various interviews with experts in the field of NCA and ILM, we aim to find and describe various fruitful opportunities that could or already are bringing the fields of ILM and NCA together and enable more informed decision making and planning.

Key interview questions

Question 1. Can you please tell us a little about yourself, your profession, where you have worked, (related) achievements you are proud of, your current main project or activities?

Question 2. Are you familiar with landscape approaches and/or integrated landscape management?

Question 3. What is your experience with natural capital accounting or other forms of environmental or ecosystem accounting?

Question 4. Are you aware of natural capital accounts that have been designed for use in landscape level decision making, or, vice versa, landscape management decision making that has been informed or could be, by natural capital accounts? If not accounts, then what about account-like data (e.g. on ecosystem services)

Question 5. What benefits do you think are possible if natural capital accounting and integrated landscape management were brought together in countries?

Question 6. What can be done to bring natural capital accounting and integrated landscape management closer together?

Question 7. What practically needs to happen for natural capital accounting and integrated landscape management to be developed and used in countries?

²⁵ <https://ecoagriculture.org/publication/the-little-sustainable-landscapes-book>

²⁶ <https://www.pbl.nl/en/publications/the-landscape-approach>

²⁷ <https://ecoagriculture.org/publication/defining-integrated-landscape-management-for-policy-makers/>