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

Background Report

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

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PBL Netherlands Environmental Assessment Agency is the national institute for strategic policy analysis in the fields of the environment, nature and spatial planning. We contribute towards improving the quality of political and administrative decision-making by conducting outlook studies, analyses and evaluations in which an integrated approach is considered paramount. Policy relevance is the prime concern in all of our studies. We conduct solicited and unsolicited research that is both independent and scientifically sound.

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MAIN FINDINGS

Introduction

Integrated Landscape Management (ILM) and Natural Capital Accounting (NCA) are frameworks that have been separately developed by distinct stakeholder groups. Both frameworks synthesize a broad range of theories and practices that can contribute towards the ongoing global effort of achieving sustainable development. This paper explores experience of these two approaches in more detail, particularly focusing on the links that can be made between them. A draft of this paper was provided as background material for discussion at the 4th Policy Forum on Natural Capital Accounting for Better Policy, held in Kampala Uganda, 18-19 November 2019. The draft paper was updated after the discussions at the Forum as well as inputs following the Forum.

Managing global challenges at the landscape level

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 land and water to agriculture and aquaculture is a leading cause of biodiversity loss, mainstreaming information on biodiversity and natural resource use into development planning and production sectors has never been so important as it is today.

Conventional policy approaches, that assume particular lands have one priority objective, such as farming or forestry, and that this objective is a 'trade-off' against other objectives, are no longer viable in much of the world. The ILM framework is developing as an alternative to these conventional sectoral approaches of natural resource management. The landscape level is often the best scale for managing interactions, synergies, and trade-offs for the various aspects of natural resource management. In particular, ILM can improve the inclusiveness and participatory nature of the planning process at national and subnational levels. For effective ILM, credible, accepted, accurate and up-to-date information is a prerequisite to: (1) identify key issues as well as current and future trade-offs; and (2) develop and implement effective ways to maximize benefits and minimize damage to the economy and the environment though improving landscape planning and decision making.

NCA provides standardised information on natural resource use

NCA is an information platform that systematically organises economic and environmental information that has been standardised via the System of Environmental-Economic Accounting (SEEA). The platform expands the coverage of the System of National Accounts (SNA), which produces the GDP (gross domestic product) metric. In particular, NCA adds an assessment of 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 the ILM and NCA concepts and communities closer together?

This report explores the options and potential benefits of bringing ILM and NCA closer together. It is acknowledged that both ILM and NCA are relatively new, and as such there has been very little interaction until now. However, even on the basis of the limited integration to date of ILM in NCA, and vice versa, the potentials would appear to be good and closer integration would seem very desirable.

Benefits of connecting ILM and NCA

Drawing on experiences from a range of countries, spanning low- to high-income, as well as expert opinions, we conclude that NCA can contribute to different aspects of ILM throughout the general decision-making cycle (see Figure 1):

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

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

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

Monitoring and review – This is consistently identified as the most commonly-realised benefit of NCA that has been most commonly realized to date. Presenting integrated environmental and economic data regularly and consistently would be a significant advance of value to national governments, regional authorities, local landowners and financiers alike. 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 1: How NCA can inform integrated landscape management in the policy cycle
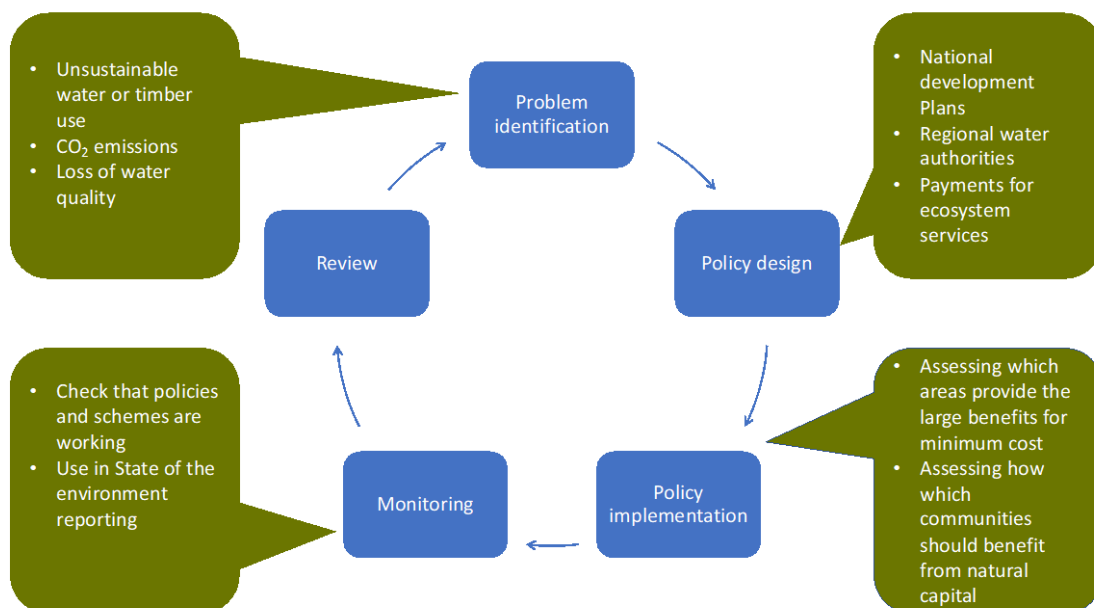
A range of valuable insights and lessons for integrating ILM and NCA in decision-making is summarised in Table 1.

Going forward

To realise the benefits of more effective integration of ILM and NCA will require:
- Greater understanding and engagement between the two professional communities as well as with decision-makers involved in land management;
- Developing and sharing of examples of successful applications of NCA to ILM;
- Better raw data for NCA;

- Building trust in both information and the decision-making processes of ILM and NCA.

To make progress in this way, some practical issues and questions should be considered by the ILM and NCA communities. These should include:

Mismatch of data access, coverage and quality – Data access, coverage and quality are recurring issues for both ILM and NCA. What are the key data set requirements for ILM and NCA?

Boundary selection – The management areas of ILM seldom match the data output areas available directly. How best to select the 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 arrangements to be more effective at landscape-level integrated decisions, i.e. shifting from silos to synergies, from overly-centralised to usefully decentralised?

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

Pilots – what scope for piloting joint ILM/NCA projects that address the above?

A key outcome of the 4th Policy Forum on Natural Capital Accounting for Better Policy was to develop a common understanding of these issues and questions. This in itself is a significant achievement. If progress towards resolving them can also be made as the ILM and NCA communities work further together and some pilot joint projects are implemented, then we will be a significant step closer to achieving sustainable development.

Table 1: Summary of insights and lessons for integrating ILM and NCA in decision making

Category	ILM perspective	NCA perspective	Better integrating ILM & NCA
Process and governance	(1) Complexity (and inclusivity) increases with the number of stakeholders (2) Geographical areas relevant to ILM do not always align with jurisdictional boundaries (3) Managing multi-stakeholder relations is challenging	(1) Needs a process that brings the different data holders together (2) Needs formal arrangements for sharing and using data e.g. high-level agreements between agencies (3) Account users need to be involved in account design and construction so accounts are relevant and 'decision-centred'	(1) Senior representatives 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, but the start of an interactive process to both improve the accounts continuously and further embed their use in ILM processes.
Data and methods (information needed)	(1) ILM is inherently a process that needs to be fed by data and analysis (2) A more standardised approach to ILM data needs would likely assist with implementation (3) ILM requires data and methods that focus on multifunctional uses (like mosaics, agroforestry)	(1) Data is scattered between different agencies (2) Some key data could be 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	(1) Need to accurately represent the quality of data in information products (2) Need to have data quality assessment processes in place (3) Need to continuously improve data sources for the accounts
Challenges in project implementation	(1) Challenge of integrating data originating from various administrative classifications (e.g. districts, watersheds, economic growth zones) (2) Socioeconomic data often lacking, compared with remote sensing derived data (3) Dealing with spill-over effect beyond landscape boundaries	(1) Breaking down national level information to match landscape (regional or local) area (2) Scaling up local data to match regional or national data (3) Spatially representing information can create issues with confidentiality (security, ownership, etc) (4) Gaining an understanding of ILM and landscape-level decision-making terminology	(1) Defining boundaries for NCA that align with ILM regions (2) Gaining common understanding of terminology between ILM and NCA communities (3) Need to highlight existing NCA potentially useful to topical landscape decisions and produce NCA quickly to demonstrate usefulness to ILM community

Category	ILM perspective	NCA perspective	Better integrating ILM & NCA
Funding and finance	(1) Lack of financing of ILM has been mentioned by a small number of governments and international organisations and NGOs (2) Challenge of connecting large investors and funds to small landscape interventions (3) Strong link to sustainable finance and corporate social responsible activities	(1) So far finance has been mentioned by a limited number of governments and international organisations and NGOs	(1) A compelling case can and should be made for pilot studies of applying NCA to ILM (2) Funding by national governments and international agencies is important initially (3) Funding can come from a range of international, national and local stakeholders. Joint funding may increase commitment to on-going production and use of accounts
Communication	(1) ILM is not a well-known term but the general concepts of it are recognised and understood by land managers (2) The concept is strong in illustrating interactions, either between activities in landscapes, or trade-offs in SDGs	(1) NCA is not well understood; need to address this early in account production (2) Need a plan for communicating NCA results to users and the general public (3) Diagrams, maps and charts work better than pages of tables	(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 (3) Good examples are important (4) Need to recognise the limits of data quality
Potential in decision making (use in policy cycle)	(1) So far mainly useful in the identification of issues, bringing stakeholders to the table, development and implementation of interventions at local level (2) Could be scaled up to be useful at higher levels (national and multi-country) (3) Strengthen role as participatory mechanism in achieving global goals for sustainable development	(1) So far mainly used in monitoring, review and problem identification at national level (2) Could be used at subnational levels and in other parts of the decision-making cycle with additional analysis and modelling (3) Could be used in policy design and implementation, mainly useful in the identification of issues, development and implementation of responses	(1) Monitor and review the sustainability of current land use and land management (2) Assess trade-offs between land use, management and investment decisions (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; 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, who deliberately do not extend into policy interpretation and analysis (2) Accounts are usually at the national level. We need landscape-level accounting 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. Hence ILM and NCA need to be "ahead of the game"

FULL RESULTS

1 Introduction

This paper was prepared as a background document for the 4th Policy Forum on Natural Capital Accounting for Better Policy, which was held in Kampala Uganda, 18-19 November 2019.[1] The focus of the 4th Policy Forum was the application of natural capital accounting (NCA) to integrated land management (ILM).

The key objective of the Forum was to explore how linking NCA and ILM can accelerate national agendas, such as effective 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. The overall context – achieving the Sustainable Development Goals (SDGs)- was also touched upon, but were not central to the agenda of the 4th Forum as they were the explicit focus of the 2nd Policy Forum[2] and subsequent publication (Ruijs and Vardon, 2018). The use of natural capital accounts to achieve the SDGs has also been examined in detail by Ruijs et al. (2018), which concluded:

- The accounts are particularly relevant to measuring 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).
- However, the accounts have so far not been used to either assess progress towards SDGs or design policies to achieve the SDGs.

The participants of the 4th Policy Forum were government representatives from developing and developed countries, as well as from organisations working on accounting, environmental-economic policy, and landscape management at subnational levels or in sectors (e.g. agriculture, forestry, conservation, etc.). To support the better linkage of ILM and NCA, this document provides:

- An introduction to both ILM and NCA (Sections 2 and 3, respectively);
- Examples of how the concepts and practices of ILM and NCA have come together in countries (Section 3), with case studies from five countries (Section 4);
- Thoughts from a sample of experts on the benefits and challenges of integration of ILM and NCA and a summary of key insights (Section 5);
- An assessment of how ILM and NCA can be better integrated into one another, what the benefits from this are likely to be, and how this integration can be progressed (Section 6).

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[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 landscape approaches as a concept and means for balancing multiple objectives, integrating interests from local to global stakeholders. It then focuses on ILM as a process aimed at enabling stakeholders to manage, plan, implement and monitor actions in support of 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 (Figure 2.1).

Figure 2.1: Trends on population and GDP driving global demand for natural resources
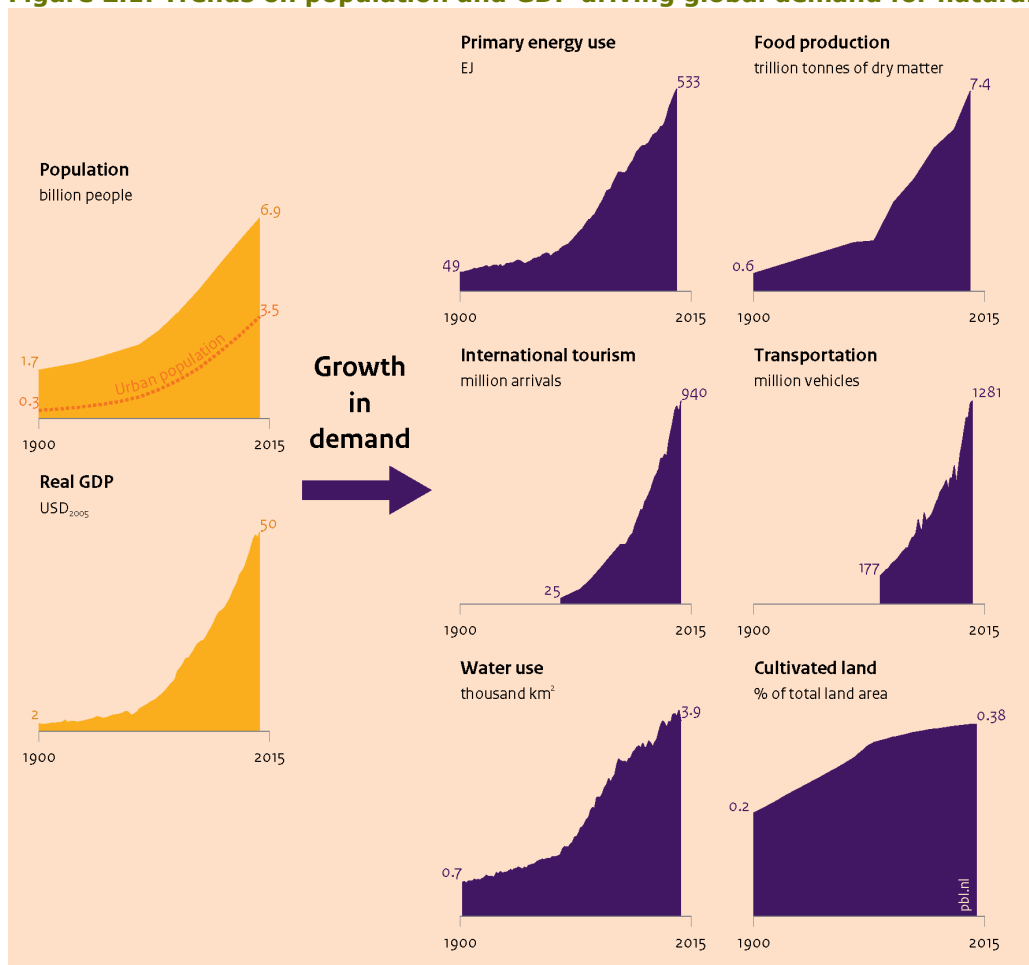
Source: PBL People and the Earth report, 2017

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

constituent targets. The SDGs provide a framework for countries to plan and achieve a comprehensive, balanced and integrated development vision for 2030. Such a framework is needed to manage the competition for resources and optimise their allocation between the individual development goals.

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 land and water 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 go to response options that do not necessarily lead to greater pressure on land, but which rather have the potential to provide multiple co-benefits in the sense of climate change mitigation and adaptation, alongside combating desertification and land degradation, alongside enhancing food security.

Spatial planning and spatially-explicit land governance is becoming 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 change the relative flows of different ecosystem services (Van der Esch et al., 2017). Conventional policy approaches, that assume particular lands have one priority objective such as farming, forestry or conservation, and that this objective is a 'trade-off' against other objectives, are no longer viable in much of the world (Gray et al., 2016; Shames et al., 2017).

2.2   Challenges converging at the landscape level

The specific actions that are required to achieve the 2030 development vision need to be planned and implemented at national and sub-national scales. This follows the desire to balance multiple goals related to both environmental and non-environmental processes holistically, for example, on livelihoods and sustainable resource management (Freeman et al., 2015). To transform national and regional spatial planning into a more interactive and adaptable spatial and land-use-planning process, there is a need for strong bottom-up components as the challenges 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). At sub-national scales, stakeholders are able to more clearly understand the impact of specific actions than at national level, and are in a better position to implement them.

The interaction of people and nature in landscapes has evolved over time. With increasing globalisation and the integration of local people in global production supply chains, landscapes are increasingly seen as the spatial scale where many stakeholders from global to local level need to cooperate in order to successfully balance competing interests and manage risks (Brasser, 2012; IPBES, 2019; Scherr et al., 2012). Thus, over several decades, the view of landscapes has developed from a perspective of geophysical boundaries in which landscapes were defined by natural processes, towards a perspective where natural processes, human actors and economic supply chains all play decisive roles.

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 (typically political science, development economics or ecology), these terms include

descriptions that focus variously on: (1) the cultural identity of landscapes, e.g. where the "sense of place" is a key element; or (2) the integration of conservation and development plans; or (3) the (ecosystem) services a landscape provides. By using the definition of Denier *et al.* (2015), i.e. that a landscape is a socio-ecological system that is organised around a distinct ecological, historical, economic and socio-cultural identity, these various dimensions can be captured, while also recognising that landscapes can also be seen as land use mosaics that are 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 common ground to 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

Source: PBL
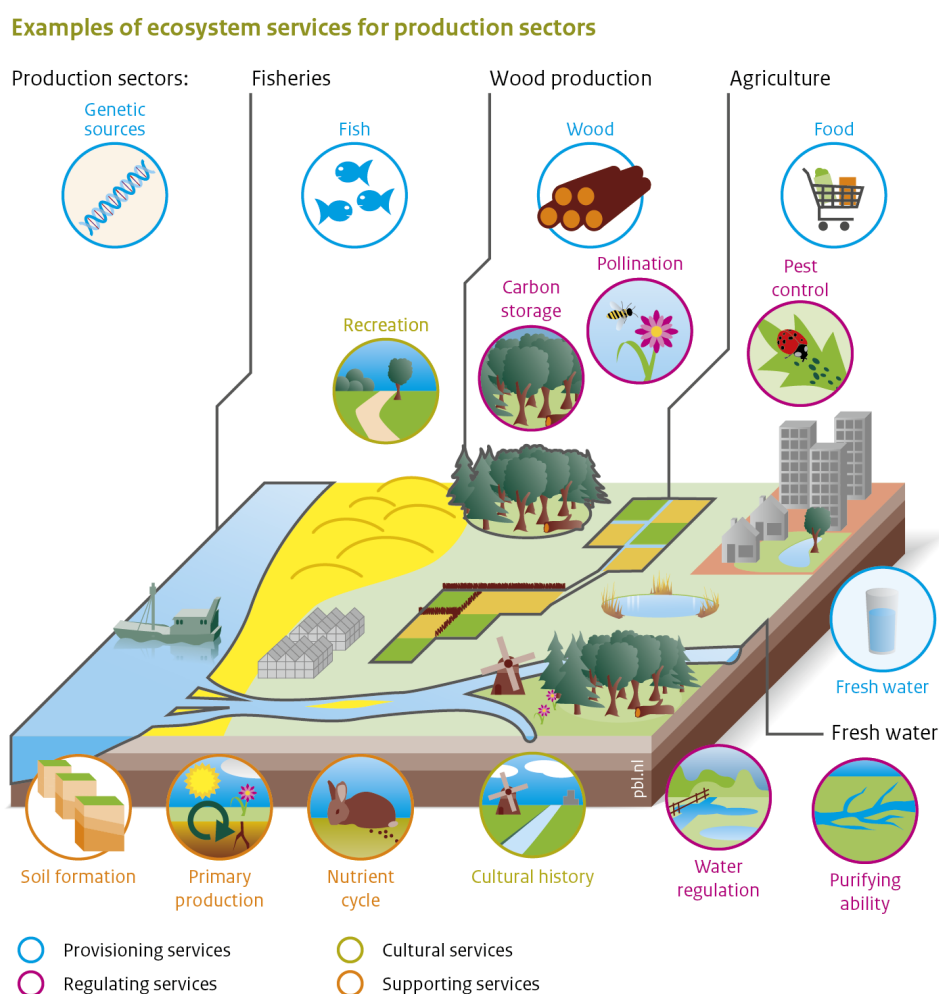
A multi-functional landscape can meet a range of local needs simultaneously, (e.g. ensuring water availability; protecting biodiversity for crop pollination and wildlife tourism; producing nutritious and profitable crops). It can also contribute to national goals and commitments for global targets (e.g. 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 landscapes using the concept of ecosystem services is common (Figure 2.2; 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, recognises three categories of ecosystem services: provisioning services (e.g. food and timber production), regulating services (e.g., carbon storage and sequestration), and cultural services (e.g., biodiversity values in local culture). Elsewhere, supporting services (e.g., nutrient cycling and soil formation) are recognised as another category of ecosystem services. They are considered necessary for the production of all other ecosystem services and differ from the other services in that their impacts on people are either indirect or occur over a very long time (MEA, 2005). All ecosystem services can be placed in the context of a landscape and therefore allow for analysing synergies and trade-offs among different ecosystem services resulting from changes affecting the landscape.

By focusing on interactions between ecosystem services and the ability to identify the various actors causing change or able to cause change to these ecosystem services, the landscape is 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 to land use have dominated the resource management field to date. However, such approaches have not reflected the multi-sectoral nature of most landscapes, which can include the aims and activities of 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 is increasingly promoted as an alternative instrument to conventional, sectoral land-use planning, governance, and management (Arts et al., 2017; Van der Horn and Meijer, 2015; Shames et al., 2017).

Historically, the landscape approach draws integrated spatial planning, a concept that was popular in the 1980s. This was inspired by discussions on nature conservation strategies in developed economies and fuelled 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 was linked to sustainable development. The concept urges cross-sectoral, multi-stakeholder, and policy integration at the "appropriate" scale, including landscapes (Figure 2.3; Arts et al., 2017, Sayer et al., 2013).

Reed et al. (2015) captured the main characteristics of a landscape approach:
"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 in integrated landscape approaches, based on their primary interests, deploying the People, Planet, Profit (PPP) scheme

Overview of the stakeholders and objectives pursued in landscape approaches
In the PPP scheme
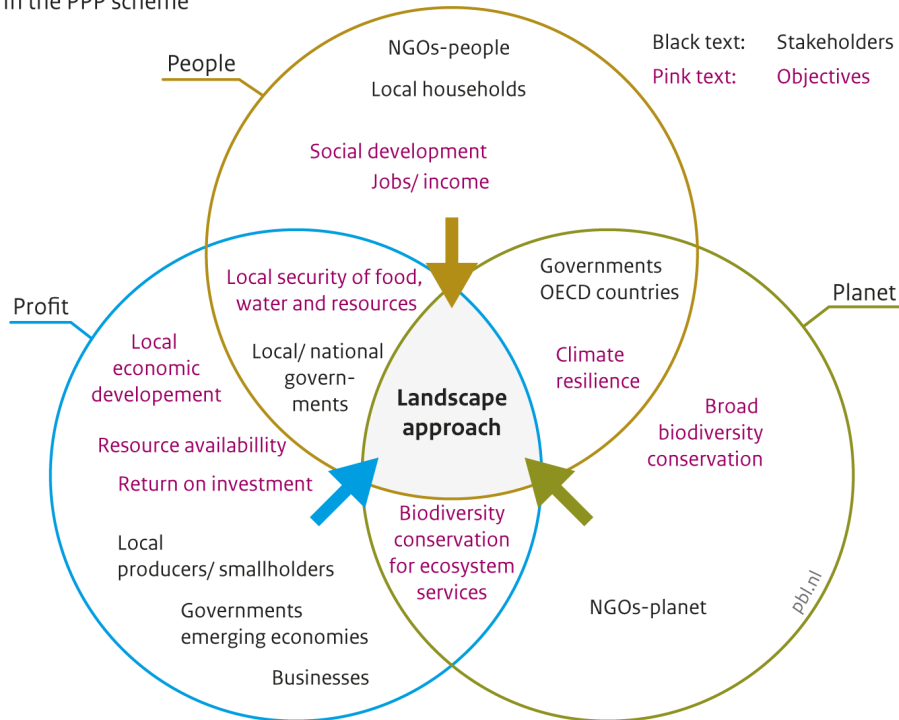
Source: PBL

www.pbl.nl

Reed et al. (2015) explain that, as well as providing an alternative to conventional sectoral planning, the landscape approach is of interest because of 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). It is able to address the many trade-offs and inequalities in access to, and 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 has also been advocated as a way to make policy, governance, and management more space- and scale-sensitive and to better take account of the linkages between people and their surroundings.

The recent IPBES and IPCC reports emphasize the need for further developing and operationalizing of landscape approaches. The main messages from the IPBES report is:

> "*cross-sectoral landscape approaches offer opportunities to reconcile multiple interests, values and forms of resource use, provided that these cross-sectoral approaches recognise 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)

Similarly, within the UN CBD submissions for national biodiversity strategy and action plans, increasing attention is given to integrated approaches at the landscape level (Uetake et al., 2018). For the CBD's new post-2020 strategic framework, landscape approaches are gaining interest as a suitable framework for contributing to the realisation of the CBD's 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 by creating a sustainable system of management that benefits all stakeholders. To achieve this, three general dimensions need to be considered (FAO, 2012; Scherr et al., 2013; World Bank, 2014):

- *Horizontal*: spatially optimising, 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 minimised;
- *Vertical*: taking into account, next to local-level drivers, the drivers higher-up, such as higher-level institutions, land tenure, government 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, and 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 ten design principles to guide landscape-level processes and by acknowledging that such processes are hard to predict and should be characterised as "muddling through" and "learning by doing" rather than *ex ante* design and planning. The ten principles of Sayer et al. (2013) 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 recognising 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 these principles is that all stakeholders are able to generate, gather, and integrate the information they require to interpret the activities, progress, and threats. Gathering and interpreting such 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 CBD to "improve sustainable use of biodiversity in a landscape perspective" (UNEP, 2011). A review of selected landscape projects in Africa and Asia found that the principles have been applied selectively, and often adapted to specific local conditions and needs (Sayer et al., 2016). However, there is overall agreement that participation, interdisciplinary, multi-functionality and sustainability are the main concepts of an integrated

landscape approach (Freeman et al., 2015; Reed et al., 2015) and this is the way term is used in this paper.

Currently, there a several global initiatives promoting the concept of the integrated landscape approach, its implementation in initiatives and organising dialogues and learning events. These include:

- *Landscapes for People Food and Nature* (LPFN) initiative: a network of organisations promoting the creation and sustainability of integrated agricultural landscapes. Partners range from global organisations such as 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, organised by CIFOR, UNEP, World Bank and the German government.
- *Satoyama Initiative*: a global network inspired by the CBD, focusing on working together to realise societies in harmony with nature and emphasising 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 towards multiple objectives for agriculture, environment and human well-being. Their geographic areas ranged from ten square kilometres to tens of thousands of square kilometres, with populations from several thousand people to several million. More than 90% of the initiatives included farmer organisations as key partners. Private sector actors were involved, but their participation could be improved. Though most of the claimed achievements of the ILIs were self-reported and not backed by quantitative evidence, 90% of Asian ILIs reported having baseline data, and aspects of monitoring and evaluation in place, enabling them to quantitatively assess ILI outcomes over time. However, greater investment in collecting and analysing quantitative data on multiple landscape outcomes was urged for the African and Latin American ILIs, , so that independent verification would be possible. Disaggregated data was needed 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 landscape approaches were that focusing on creating win-win solutions seems naïve, and that achieving cross-sectoral integration in a world of governmental policy silos and scattered and non-standardised data is highly ambitious. However, ILM and NCA approaches could address these barriers – helping 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 various stakeholders can plan, implement and monitor actions to support their goals, including the SDGs and green growth (Figure 2.4). ILM is suited to 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 mobilise synergies between different

stakeholders. Stakeholders need to be involved directly in negotiations and make commitments to incorporate agreed strategies and objectives into their own businesses and programmes (Ros-Tonen et al., 2018).

Figure 2.4: A multi-stakeholder approach towards achieving inclusive and green growth
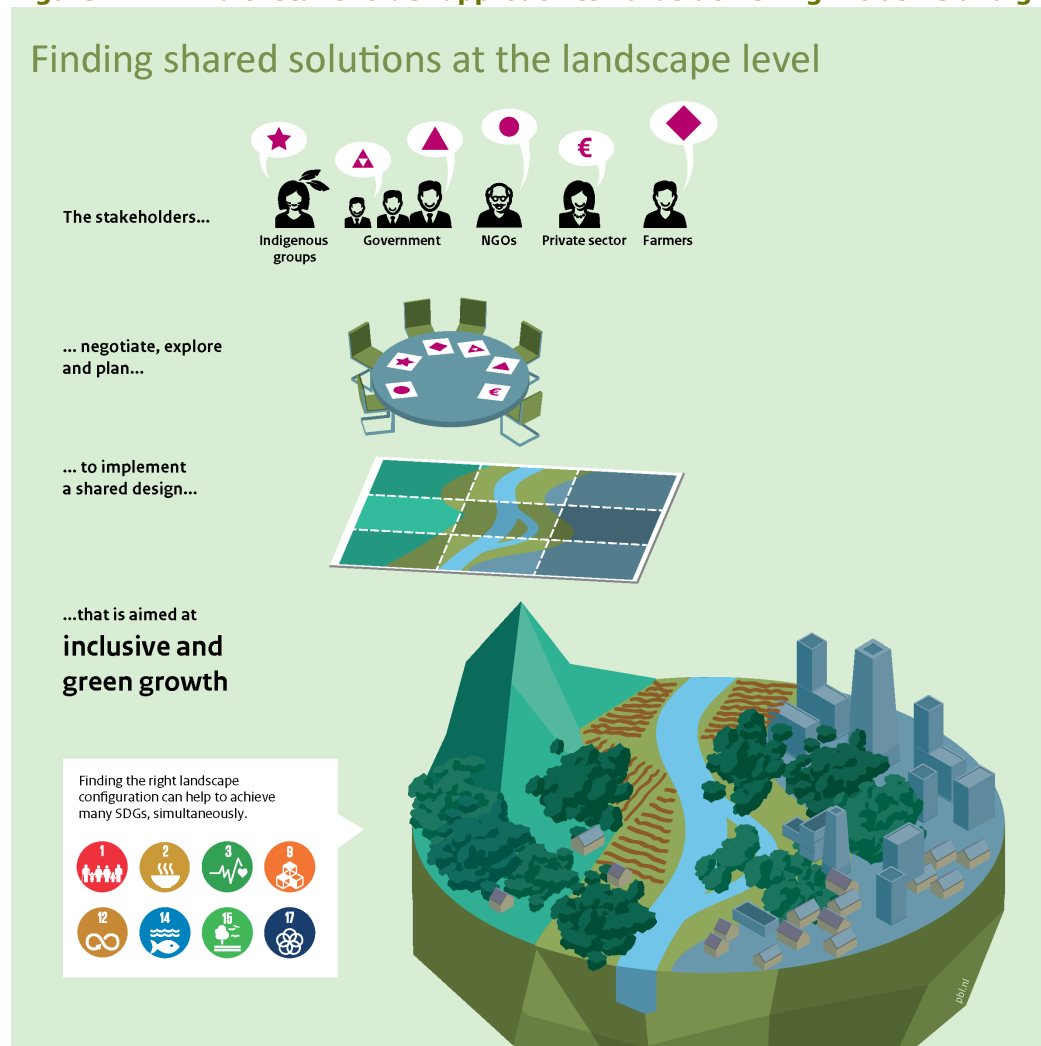
Source: PBL People and the Earth report, 2017

An effective ILM process creates an improved understanding among stakeholders on the conditions and dynamics required for a sustainable landscape, and results in a plan of action that includes win-win interventions, realises opportunities for blended investments, and mobilises collaborative action to improve institutional and policy conditions. ILM, regardless of the 'entry point' for action in a particular landscape or among the stakeholders, has five key features (Scherr et al., 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 realise positive synergies among interests and actors or to mitigate 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 follows a learning and negotiating cycle with five key elements (Scherr, Shames and Friedman, 2013):

1. Formation and organisation of a 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.

Similar features were identified by Shames et al. (2017) as goals for government management.

Spatial information and analysis, and land-use planning can 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.

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

Table 2.1: Role and contributions of knowledge providers in the learning and negotiating circle (Adapted from Burgi et al., 2017)

Knowledge Provider	Understanding of the functioning of the landscape	Exploring societal demands and environmental change	Designing future landscape options	Transforming based on negotiated interventions
Scientific community	- Methodology for synthesizing - State of the art ecological knowledge	- Climate change scenarios - Global change scenarios - Projections of Ecosystem Services 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 Ecosystem Services	- 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 for all stakeholders

Spatial planning is an important instrument that could support the ILM process, and *vice versa*. The negotiated outcomes from multi-stakeholder ILM discussion platforms could improve spatial and land use plans (Tisma and Meijer, 2018).

In order for ILM to benefit from and influence spatial and land use planning, credible and up-to-date data describing the status and flow of 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 sought after and organised by natural capital accounting.

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 the landscape approach, using ILM as an example of the landscape approach, summarising the range of experience to date in diverse countries.

3.1   Background on natural capital accounting

NCA is undertaken or being developed by governments in more than 100 countries.[3] The level of work varies, from some countries that have been producing a suite of accounts for some time (10 years plus), to countries that are just beginning to produce accounts. Box 3.1 provides a brief introduction to natural capital accounting. Useful examples of accounts can be found in databases of the World Bank[4] and United Nations.[5] Most are at the national level, while other work has been at subnational levels. While most work has been executed by government agencies, there are a few examples of academic institutions and non-government organisations that have produced accounts. Much of this work, particularly at the subnational level, has been aiming to provide information for land and water management.

Examining the effectiveness of production and use of natural capital accounts at the Policy Forum on Natural Capital Accounting for Better Decision Making held in 2016, 2017 and 2018[6] has helped to develop and validate 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, the 10 principles of landscape approaches (Sayer et al., 2013, see Section 2) can be successfully mapped to the 10 principles for 'policy-fit' NCA (Table 3.2) – there is a strong commonality of purpose and approach between ILM and NCA. Secondly, there are a number of examples of accounts produced with the purpose of aiding land management which we can learn from (Table 3.3).

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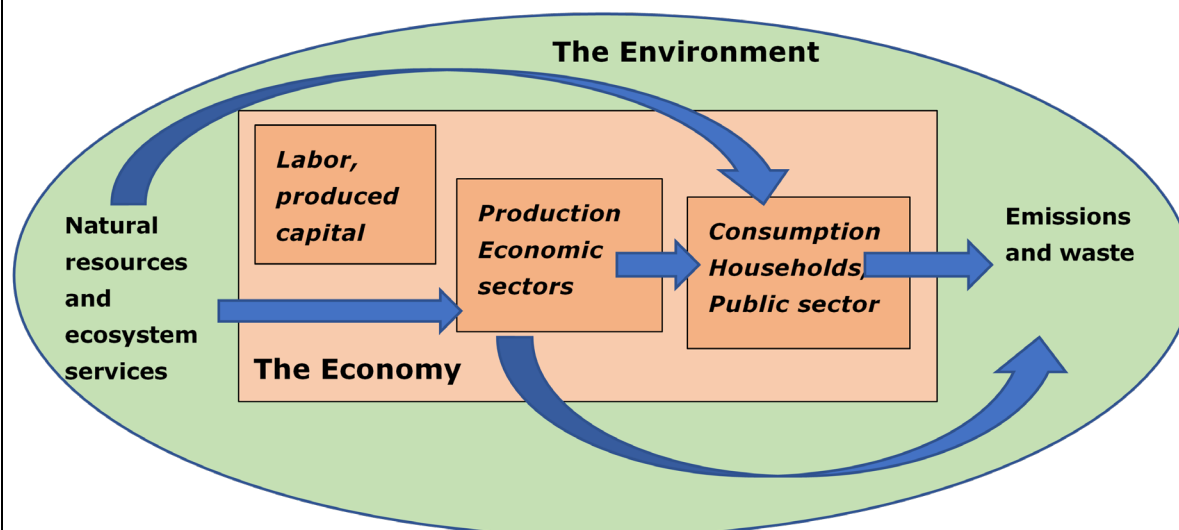
For more information on this topic, see the WAVES website, Natural Capital Accounting, http://www.wavespartnership.org/en/natural-capital-accounting, and System of Environmental Economic Accounting, https://unstats.un.org/unsd/envaccounting/seea.asp.

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-centred	Providing relevant and timely information for indicator development and policy analysis to improve and implement decisions with implications for natural capital.
5. Demand-led	Providing information actually demanded or needed by decision makers at specific levels.
Trustworthy:	
6. Transparent and open	Enabling and encouraging public access and use of NCAs, with clear communication of the results and their interpretation including limitations of the data sources, methods, and/or coverage.
7. Credible	Compiling, assessing, and streamlining data from all available sources, and deploying objective and consistent science and methodologies.
Mainstreamed:	
8. Enduring	With adequate, predictable resourcing over time; continuous application and availability; and building increasingly rich time series of data.
9. Continuously improving	Learning focused, networked across practitioners and users, testing new approaches, and evolving systems to better manage uncertainty, embrace innovation, and take advantage of emerging opportunities.
10. Embedded	NCA production and use becoming part of the machinery of government and business, building capacity, improving institutional integration for sustainable development, and incorporating NCAs use in procedures and decision-support mechanisms.

Source: Bass et al. (2017)

3.2   What roles can NCA play in ILM?

A number of land allocation and management actions can be informed by NCA, for example, :
- Assess trade-offs between social, economic, and environmental use of land;
- Maximise economic returns from investments in land and land management;
- Minimise environmental degradation from economic activities on land;
- Achieve sustainable development.[7]

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[7] As noted in the Introduction (Section 1), 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 here.

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

ILM principle name and number	Notes on the ILM 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 to NCA Principle 9 Continuously improving (Table 3.1). A feature of macro-economic management is the regular data that is 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 macro scale 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. Multi-functionality	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 operationalise, 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 operationalise 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 operationalisation difficult	Regular production of NCA at multiple spatial scales would provide a framework for operationalising 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 organisation 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 CO2 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 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 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[8]
South Africa		Spatial Planning Ecosystem restoration Water security Protected Area expansion Biodiversity mainstreaming	Reported at the 2017 Policy Forum[9] [10] Reported at the 2018 Policy Forum[11]
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 including honey	Yet to be officially released but reports at 2018 Policy Forum[12]

[8] 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
[9] 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
[10] 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
[11] 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/
[12] 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 illustrate the use of the NCA for ILM, we briefly present the experience from five case studies: Australia, Indonesia, Guatemala, Rwanda and The Netherlands. Other examples can be found in the publications referenced earlier in Table 3.3.

The case studies selected are: (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) planning and ecosystem accounts (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 recognised in the accounts and the information could be used in decisions about integrated land management. In addition, a key benefit in the development of all the accounts was that account producers and land and water managers were brought together enabling an increase in the understanding between the two groups. This ensured that relevant data was available and that the quality of the data was understood. In some cases, draft accounts were revised and updated information was included in the final versions of the accounts.

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

Ecosystem accounts that have been developed in Australia for the Central Highlands region, near Melbourne are informing a 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 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. Synthesising 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 exploration of ecosystem accounts was done as native forest timber harvesting conflicts with other industries including water supply and tourism. To help assess the situation, accounts of the ecosystem services of water provisioning, carbon sequestration, biodiversity conservation and recreation were developed. As well as the values of ecosystem services, 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. They also showed that 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).

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 parties.[13] The discussion was important, as it enabled potential users of the accounts to see what they looked like, to ask questions and to consider how they might use the final accounts. These discussions led to the addition of plantation forests to the final accounts when they were released.

Figure 4.1: Value of ecosystem services and Industry Value Added (2013-14), and the potential changes if native forest harvesting ceased
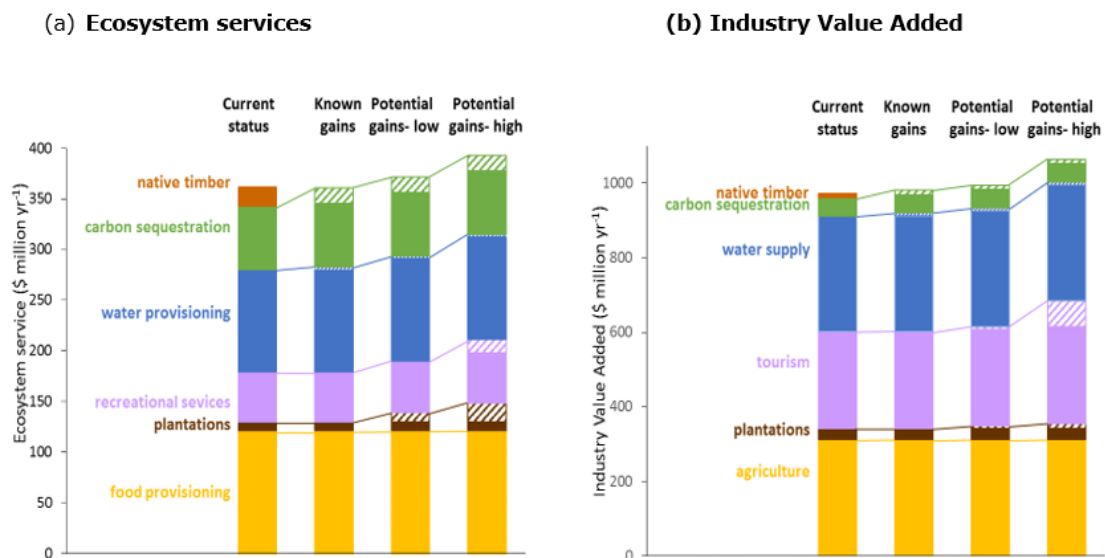
The accounts for the Central Highlands also produced estimates for how the value of ecosystem services and industry value added would change if the harvest of native forests for timber stopped (Figure 4.1). Estimates were made for known gains, mostly to carbon sequestration and water provisioning, as well as potential increases in tourism and timber provisioning from plantation forests were also accounted for.

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

- The need to identify the drivers of ecological change. It is important to understand the reasons for change in the past and to allow for prediction of future changes.
- The economic data available are generally for large spatial areas, and not related to biophysical characteristics. 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 must align with the data sources available. The many sources of data 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. In general, the biophysical data needs to be scaled up and the economic data scaled down.

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

- Multiple products are going to be needed if the communication of accounts information is to be effective for multiple audiences.

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 recognised) 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). 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. In particular, it has a large forest area that is shrinking due to economic development – from 2000 to 2010, Indonesia averaged about 6% economic growth due largely 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% in 2019. But these gains were accompanied by significant pressure on natural capital, which is now likely to threaten 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. Forest area decreased 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 for Indonesia's population: 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 management challenges. More recently, comprehensive analysis of the prospects for a low-carbon economy allowed Indonesia's Government to better understand the ways to grow the economy sustainably and reduce pressure on natural capital. Bappenas (Indonesian's National Development and Planning Agency), 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.

Within this, Indonesia's peats swamps are an important store of carbon: consequently, special accounts were prepared for them[14] in addition to the land accounts. These accounts and related modelling allowed the government to explore ways to maintain economic growth while minimising forest and peatland loss, thus keeping the emissions low. One of the key findings of the LCDI report was 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

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[14] 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

reducing 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 (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, while peat degradation should be largely avoided. Investments totalling between US$14.6 billion to US$22.0 billion per year for 2020-2024 are required to realise such improvements. This is equivalent to between 1.0 and 1.7% of GDP.

Further analysis of the accounts combined with a modelling exercise helped to understand how economic growth could be constrained by the limits of natural capital and the ecosystem services that it provides (i.e. provisioning, regulating and cultural services). In terms of policy uptake, this represents a key contribution of NCA in Indonesia as this work underpins decisions that could be made in the next five-year policy cycle.

4.3   Guatemala: climate change

The development of natural capital accounts in Guatemala was useful for understanding the impact of the economy on the environment and the contribution of the environment to the economy. The accounts were also used for identifying opportunities for innovation and promoting activities that could lead to sustainable development. From a macroeconomic perspective, the accounts were useful for sending signals to decision makers about the need to reduce negative externalities and to promote green growth. Importantly, the accounts helped to inform the national development plan and the competitiveness strategy (Castaneda et al., 2019).

In support of ILM, Guatemala's agriculture and environment accounts provided information for strategic decisions on issues of food security and sovereignty, which are critical for future development and poverty reduction and are a primary concern of the National Development Plan. The ecosystem accounts were also useful for deepening the analysis of natural capital's potential for meeting the priorities of economic and social policy responses.

For climate change, the accounts provided the basis for a forward-looking perspective and useful information for appraising 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, prioritising the protection of the vulnerable population and their livelihoods, and identifying opportunities for better development of the country.

Figure 4.2 Forecast availability of water under climate change scenarios for three ecological zones of Guatemala
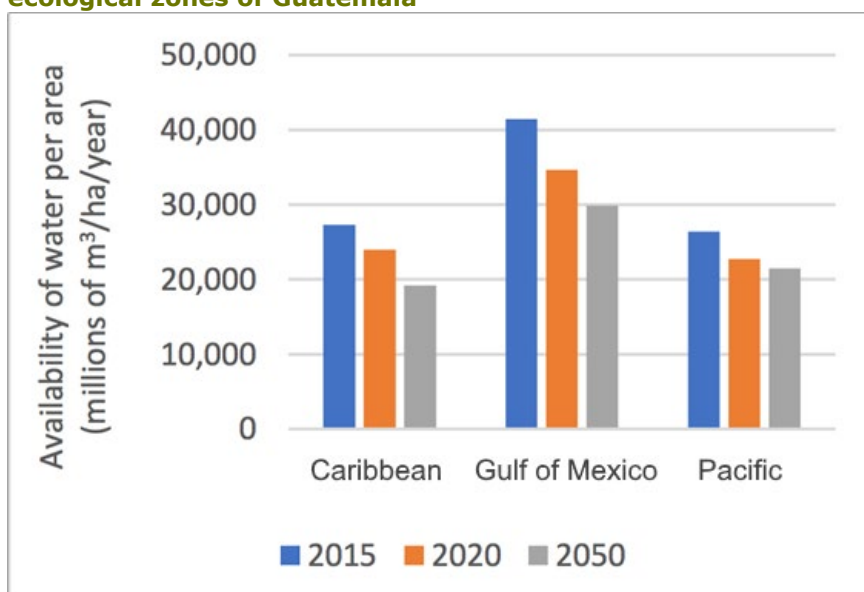
As an example of the information that the accounts provided and that was used to inform climate change policy, Figure 4.2 shows climate change scenarios for the availability of water in the future for three different ecological zones within the country. The modelling shows declining water availability across all areas. It enables national and local agencies to plan for reduced levels of water and to assess development options. For the latter, 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 GHG emissions and the main source of energy in Guatemala was fuelwood. The accounts showed that the total human contribution to GHG emissions from the combustion of different energy sources accounted for 45.6 million carbon dioxide metric tons equivalent.

Climate change is also related to forest extent, condition and use, including fuelwood extraction from forests and agricultural areas expanding into forests. The forest accounts for Guatemala showed that 40% of forest cover was lost between 1970 and 2005, and moreover that forests in nine out fourteen ecoregions were severely fragmented – to a point where their integrity and the provisioning of natural goods and services can no longer be guaranteed. The economic costs of forest loss and degradation, such as loss of 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 occurred outside the control of government institutions. Furthermore, analysis of the accounts showed that the impact of the harvest of fuelwood on the forest was greater than previously thought. While there was a loss of forest, the contribution of forest products to the national economy was noteworthy, accounting for 3.15% and 2.57% of GDP for the years 2001 and 2006, respectively.

The natural capital accounting work in Guatemala has already been used by a number of government agencies and their policy documents. For example:

- The Ministry of Public Finance's Environmental Fiscal Strategy 2018 established strategic lines for incentives and taxes to reduce and manage environmental impacts.[15]
- The Ministry of Environment and Natural Resources used accounts in the report of the State of Guatemala for monitoring and evaluating environmental trends in Guatemala[16] and in the Base Document of the environmental pact in Guatemala 2016-2020.[17]
- The Climate Change Science System first used the accounts in a report that systematises the climate change knowledge of Guatemala and uses this to assess the probable repercussions for the country.[18]
- This use of accounts bodes well for embedding NCA, helping to better integrate Guatemala's institutional arrangements

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 km^2, a population of about 12 million meaning there is an average of 455 people per km^2. Considering that the country has limited natural resources and land availability is a constraint to achieving food security, agricultural productivity must be increased. However, the high population density leads to plot fragmentation, land scarcity, and land degradation.

Rwanda has been developing NCA as a tool to enhance the sustainable management of the environment and natural resources as well as a green growth strategy. The NCA work began with land[19] and water[20] accounts, with some preliminary work on minerals, these three areas having been identified as the key pillars of economic development and sustainable growth in Rwanda. The information from the land accounts (Figure 4.3) shows that from 1990 to 2015 forest and woodland areas decreased, while agricultural areas increased. This development was most dramatic in the Western Province, where the area covered by forest and woodland has more than halved and the agricultural area more than doubled.

Even though Rwanda is a naturally water-rich country and its water resources include a dense system of lakes, rivers, marshlands, ground water and soil water, these resources are under pressure due to population growth, intensification of agriculture, rapid urbanisation, industrialisation and climate change coupled with more weather extremes. In turn, these pressures have led to water-related soil erosion, land degradation and sedimentation.

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[15] http://www.minfin.gob.gt/index.php/acuerdos-ministeriales/2-uncategorised/3502-estrategia-fiscal-verde
[16] Http://www.marn.gob.gt/Multimedios/8879.pdf
[17] Http://www.marn.gob.gt/Multimedios/2547.pdf
[18] Https://icc.org.gt/wp-content/uploads/2018/06/Infor_reporte_ESP_2018-05-28.pdf
[19] http://www.minirena.gov.rw/fileadmin/Media_Center/Documents/RW_NCA_Land_Account_March__2018__IV__1_.pdf
[20] https://www.wavespartnership.org/sites/waves/files/kc/18_Mar_2019_RW%20NCA%20Water%20Account__Final.pdf

Figure 4.3: Land cover change per province, Rwanda, 1990-2000-2010-2015
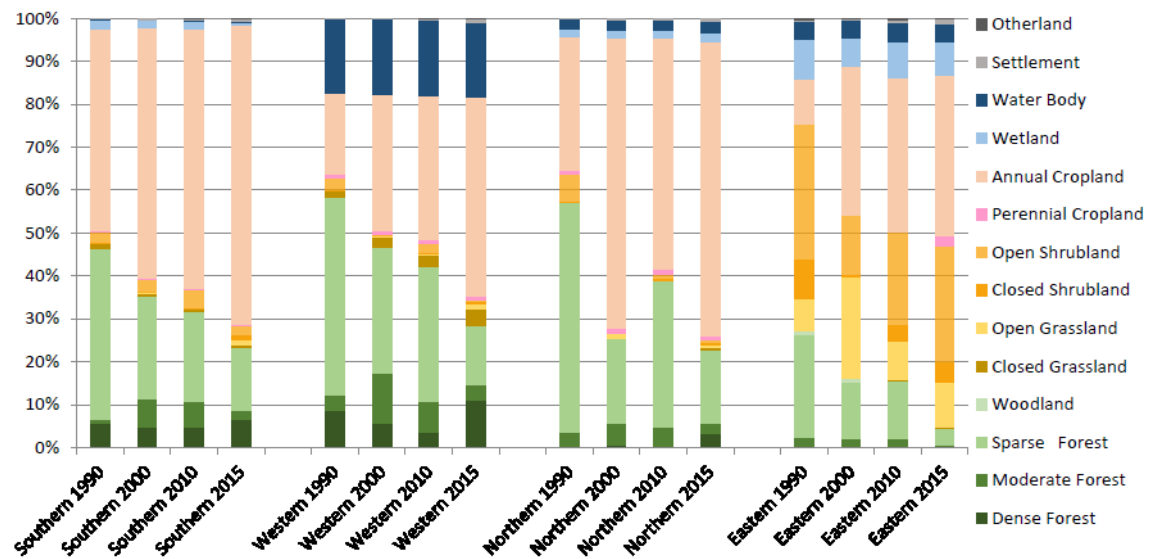
Source: NISR Rwanda land account, 2018

The changes in forested and agricultural areas were analysed by combining maps from the land account with precipitation and watershed information from the water account which provided insight in changes in various ecosystem services. Over the period 1990-2015 the average runoff increased by 35%, potentially indicating problems with flooding and water quality. The analyses also showed that the land cover changes resulted in increased sediment flow into water bodies, which was most pronounced in the Western Province, and impacted on the productivity of agricultural activities. Such consequences pose increased risks to the horticultural investment programmes being developed in the country and the Western Province in particular.

In order to tackle these challenges, the government, supported by various partners, proposed landscape catchment planning, an instrument commonly used to promote integrated water resource management. The catchment plan for the Sebeya catchment, located in the affected Western Province, is one of the first to be implemented in Rwanda in a truly participatory manner.[21] 30 years ago, most of the Sebeya catchment was covered in dense natural forest. But with population pressure, 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. Emergency restoration measures in the catchment had shown that it was possible to reduce erosion and reduce 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 minimise water related disasters". Catchment restoration work, including reforestation of high-risk areas, combined with terracing and climate smart agriculture practices, should now allow farmers to continue farming in the Sebeya catchment without causing further soil erosion and increasing run-off.

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[21] https://waterportal.rwfa.rw/node/3135

Many innovations were involved in developing Rwanda's NCA, both in process and in content. A Strategic Environmental Assessment (SEA) was performed and inter-district collaboration around natural resources was promoted. This was done 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. Water monitoring systems were rehabilitated and developed to provide better information in support of catchment planning and IWRM in the future. Catchment restoration opportunity maps (CROM) and a decision support system were developed using the national land use and cover data and are also relevant for the improvement and use of the land and water accounts. In this, seeing how the data in the accounts is used in the decision support system, enables key data to be identified and improved or missing information to be added.

4.5   Netherlands: supporting integrated landscape planning

Each spatial planning strategy in the Netherlands has been a product of its time, followed and adjusted as necessary to the political, economic and societal context. In the 1980s, the Netherlands had a centralized spatial planning system supported by 'hard' (financial and regulation) instruments; but this gradually transformed into a decentralised planning system with 'soft' (guidelines and stewardship) planning instruments.

Today, Dutch spatial planning policies are mostly decentralised. With the exception of cultural heritage, the Natura 2000 conservation areas and the National Ecological Network, policies are decentralised and managed by individual provincial and municipal authorities. Decision-making on possible extensions of natural areas, and the way they are developed and designed, was also delegated to the provinces.

Responsibility for the environment is covered by a range of legislation that is scattered over numerous 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 a National Environmental & Planning Vision. The new 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 by exploring the choices available at the landscape level (Figure 4.4).

Figure 4.4: Exploring landscape level choices towards a high value living environment
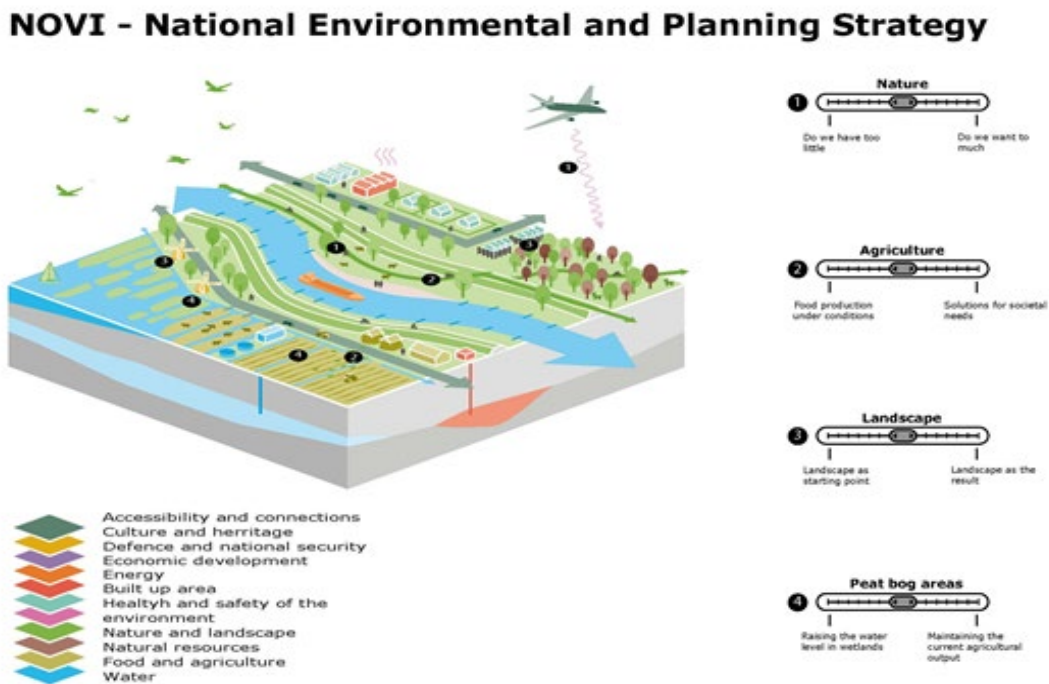
To support this, the new Act seeks to modernise, harmonise and simplify currently fragmented rules and integrate them into one legal framework. Land-use planning, environmental protection, nature conservation, construction of buildings, protection of cultural heritage, water management, urban and rural redevelopment, development of major public and private works, and mining and earth removal will all be brought under one act. In this, the landscape is recognised as an important scale for planning and negotiation on spatial developments. An important strategic question is: how can the values of the natural capital be maintained and sustainably utilised?

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

Figure 4.5: Challenges identified in selected landscapes for conservation and improvement of natural capital supporting sustainable food production, 2016

Source: WUR, PBL
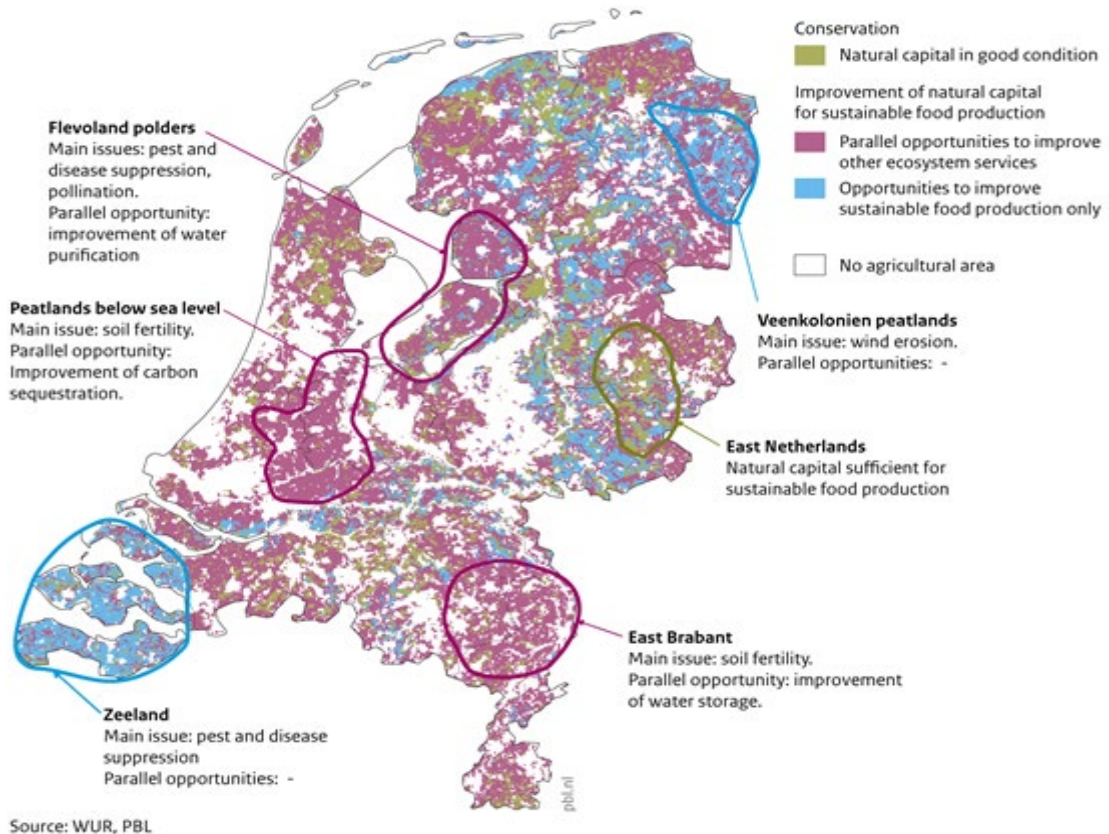
These accounts showed that the supply of ecosystem services varies, depending on the availability and condition of the ecosystem. The demand for services also varies by region. Based on this, various landscapes and provinces have explored planning strategies that promote sustainable food production. The main outcomes are shown in Figure 4.5. On the one hand, these strategies aim to promote sustainable use and protection of existing natural capital, like a healthy soil and natural agricultural field margins. On the other hand, they also aim to increase the use of natural capital by improving particular ecosystem services focusing on pest control, pollination, erosion control and soil fertility. Local projects were set up by public, private and civil society actors to realise this ambition. Potential synergies derived from this for other stakeholders within given landscapes were also assessed to promote a multi-functional planning approach. All of this 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 a collective understanding between these two communities is only just beginning. While interaction is still in its infancy, the work to date is encouraging and demonstrates that accounts can be produced and that decision makers at various levels can see opportunities for using NCA in ILM and also how ILM can inform the development of accounts.

Below we report on interviews with people who are experts in ILM, NCA or 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 maximise the possible uses of NCA in ILM. [22]

5.1   Expert views on connecting ILM and NCA

Below we discuss the interviews under the main themes that emerged:
* 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.

In the discussion some quotes for the interviews are provided to highlight particular issues. The identity of the interviewees remains confidential, although some information on their role in ILM or NCA is provided.

Awareness of NCA in the ILM community (and vice versa) – 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 involved in ILM said:

> "*I see NCA as a means to an end. And in that framing, the use of NCA and national level accounting and economic planning makes a tonne 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*

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[22] The interviews were conducted via skype. Potential interviewees were identified by the authors and members of the Organising Committee of the 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 organisation 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. The Annex of this document contains the briefing note and questions.

document different aspects of sustainability within landscapes. And I would say we haven't come across [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 monetised."

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 [those in the ILM and NCA communities] 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 Ecoagriculture 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'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 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.

"Is there a distinction between natural capital accounting as it's being defined here and a systematic indicator set 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.

"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 was identified, a key benefit 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 ongoing 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's also spatially irrelevant. The granularity is just useless to them because it's so aggregated."

Interviewees also recognised that in data-poor environments, data from NCA might be the best available, while 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 accounts can help 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 different starting points of ILM and NCA were noted, including by an environmental scientist 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 recognise the differences and to demonstrate the benefits of linking the two. Some real examples of benefits were noted. A government official working from an embassy in Africa who is an expert on integrated water management spoke about a project that highlighted the potential link between ILM and NCA:

> *"There were some interesting things happening that link the two. We recently had an assessment done in preparation for the establishment of the Water Resources Board. This assessment started from the premise that if [country] wants to reach its economic goals that it has set, the water requirements to get there are in the range of 50 per cent 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 is 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 to 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 both need to be trusted and processes 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 Technical Working Groups made up of key stakeholders (sectoral agencies, finance ministry and statistics agency) that work together regularly to develop, quality check and approve the accounts and their findings before the senior government officials meet in the National Steering Committee to provide guidance and approve the NC accounts. It is important to*

focus on the quality of data and priority questions to inform policies and decision-making processes."

How to bring natural capital accounting and integrated landscape management closer together – Bringing the ILM and NCA communities closer is a challenge. It has seldom happened and the 4th Policy Forum's focus on ILM was perhaps the first genuine attempt at this, at the international level at least. As such, the 4th Policy Forum can be said to have initiated the discussion. The challenge now is to ensure that the two communities keep talking and that something happens after the Forum. A practical approach is needed and the development of accounts for particular landscape areas and problems would provide a reason to keep talking.

A point made by several interviewees was that, if NCA is 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. It was seen as important that the publication of the accounts is not an end point but rather a key point where 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 have to be allocated: the first is outlining the problem and steering the process of account design, development and use. The second is the technical construction of the accounts. For both tasks high-level support is needed from the organisations that will produce or use the account. This support is 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 is needed, especially to access and share existing data, as well as to generate new data (e.g. from additional surveys of farmers) or to develop new models for estimating missing data. The general experience of WAVES Partnership countries has been that a high-level steering committee is 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 interviewees, including a senior government official responsibility 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 was also noted by several interviewees that the NCA and related technical analysis were inputs to decision making, but that the actual decisions had to be made by people.

> *"We should not be optimising 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 on addressing different audiences, a senior government official responsible for environmental reporting said:

> *"In my view, narrative and storytelling. 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 who's raised it with them, and because it's an issue they care about [even if] they might not be the central bank economist who's got an overarching view of the whole gamut of policy."*

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 spatial areas for decision making and hence the data needed for these areas was critical

> *"One challenge here is scale and boundary delineation. So, if you're talking about a framework that tries to take disparate social and environmental dimensions and resolve them down to a more standardised 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"*

The SDGs and National Development Plans were noted as possible entrées 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 lace."*

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

> *"We need to find a way to bring the national and the local planning process together. One very strong thing here is there is a vision 2050 and the targets are there, and everyone works towards them. But then you need to translate that locally and that translation is a challenge. I can imagine that if you want to do 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 localised to help you make the calculation."*

Many saw the accounts as way of assisting communication with financiers and of providing some trusted information.

> *"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:

> *"Funding mobilisation would start with integrating NCA activities in the national budgeting processes for concerned sectoral and statistics agencies. Then also consider development partners with interest and 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 communities together."*

5.2 Connecting NCA and ILM in the policy cycle

The policy cycle has been used as a way of showing the many ways that NCA can link into decision making (Vardon et al., 2016), a framing which has been used in previous fora (e.g. Bass et al., 2017). A version of this cycle and its connection to integrated landscape management is presented in Figure 5.1, which draws on information from the previous sections including the interviews of people involved in ILM and NCA.

Figure 5.1: How NCA can inform integrated landscape management in the policy cycle
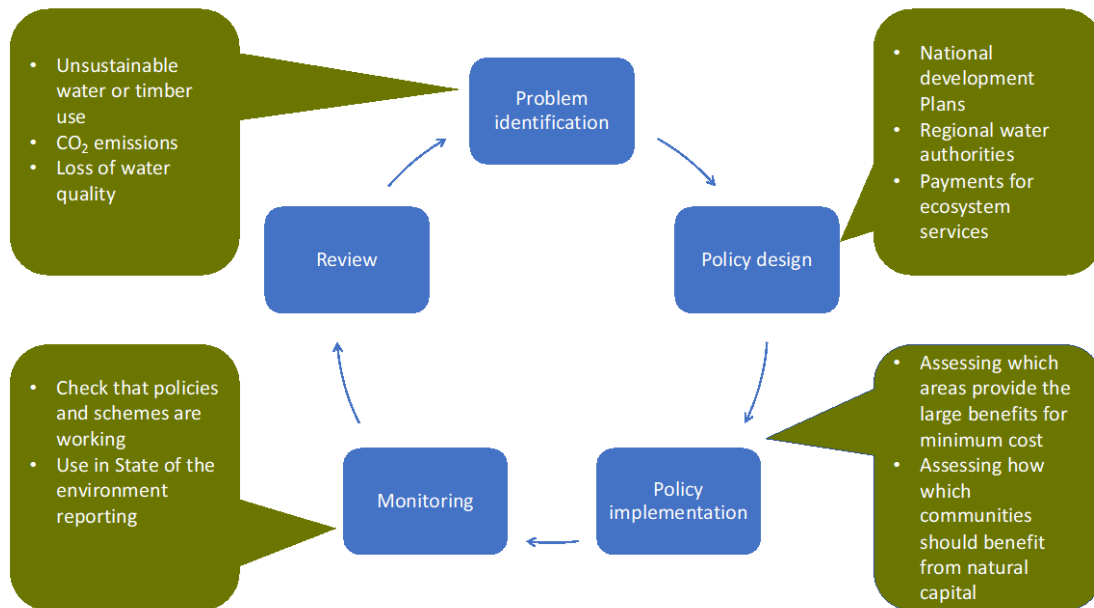
Problem identification – Work to date indicates that NCA has a key role in identifying problems and especially for spatially locating existing problems. In this, the maps of accounting data have been particularly useful for communicating to decision makers where the problems were. The accounts, when coupled with appropriate modelling, were also useful for 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 landscape-level trade-offs. For example, modelling has shown how changing levels of forest cover could cause changes in the amount and quality of the useable water available from watersheds managed for water supply, and this modelling can be combined with information on other services provided by forests and by alternative land uses. Such combined information could then inform new policy instruments, such as payments for ecosystem services, or encourage the finance sector to examine the broader benefits and risks of investments in major infrastructure projects.

Policy implementation – A potential revealed by experience to date is that accounting could be used to identify particular places and communities that might benefit most from improved natural resource management, allowing policies to be more efficiently targeted. This could be the poorest communities or the areas either at most risk of degradation or that would deliver the greatest and multifunctional benefits from the least investment (i.e. the low hanging fruit).

Monitoring and review – This is consistently identified as the key benefit of accounting. Presenting integrated environmental and economic data regularly and consistently would be a significant advance of value to national governments, regional authorities, local landowners and financiers alike. It enables regular discussion between stakeholders and helps to redress the power imbalances between national and local stakeholders who cannot always access such information. The regular production of the accounts would also lead to improvements in data availability and quality as well as increasing the trust in the accounts at all levels (local to national).

6 Going forward

The development of ILM and experience with it around the world – and with land and ecosystem accounting in particular – has demonstrated that structuring information in the form of accounts can reveal information that is critical for landscape-level policy. Accounts can show important interactions between human activities and ecosystems, and how this impacts on levels of use of ecosystem services in particular areas, as well as on the extent and condition of ecosystem assets (e.g. Vardon et al., 2019). Accounts have already provided information in support of policy improvement (e.g. Bass et al., 2017; Ruijs and Vardon, 2018). But there are still several general issues for discussion where progress still needs to be made if information and landscape-level management and governance are to improve (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 areas 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-centralised to usefully decentralized?

Inclusion – how 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 recognise that a significant barrier to the use of NCA, particularly in the conservation community, has been misunderstanding about NCA. That is, that NCA (and in particular accounting for ecosystems) is an attempt to value everything and favour "the commodification of nature" – and hence is part of the dominant economic paradigm that has caused the very problems we face (e.g. Monbiot, 2014). Others argue that if ecosystems are not valued, then they are effectively given a zero value, and hence will always be secondary to mainstream economic values (e.g. Schröter et al., 2014).

That noted, drawing on the examples discussed in this document as well as many examples presented in previous Policy Forums and elsewhere, it is clear that a wide range of developed and developing countries have produced accounts. In various countries and to varying degrees these accounts have been used to inform integrated landscape management processes. A range of valuable insights and lessons for integrating ILM and NCA are

summarised 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 of NCA 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 resources is also apparent for water, timber and non-timber forest products (e.g. fuelwood, honey) in specific areas, where there are sometimes competing land uses. Ecosystem services are often mapped to assess the trade-offs of certain policies, although assessments of trade-offs are usually not included in formal accounts of government agencies. Furthermore, for many landscape initiatives, basic information describing the characteristics of the landscape and trends in land use and water use are often lacking. While it is not yet fully, demonstrated it seems practical for top-down NCA and national or sectoral level policies to be linked to bottom-up NCA and applied at the landscape level.

While there is work which demonstrates potentials, 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 (integrated) land management. Two ways forward can help: workshops to introduce decision makers to NCA prior to their release have been effective (e.g. in Australia); as has linking the accounts to forecasts of what might change under different management scenarios (e.g. in Indonesia).

Exploring scenarios and spatial modelling using NCA can help to improve stakeholders' awareness about landscape dynamics and the relative importance of different drivers of landscape change, such as a growing population and increasing urbanisation, 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 negotiating positions around strategy, production and resource management practices, and spatial planning.

This brings us to a final consideration: quality. Getting accounts used means getting them trusted by decision makers. Greater understanding about what accounts are and what they can do certainly assists this. But it needs to be complemented by a process for assuring the quality of accounts. The accounting community recognises that, while there may be discrepancies between different data sources as well as data gaps, government and business must continually make decisions with imperfect information. Statistical agencies recognise the six dimensions of data quality – relevance, accuracy, timeliness, accessibility, interpretability and coherence. For individual data sources the focus has mostly been on accuracy (i.e. closeness of estimate to the real number) but accounting addresses all of the six dimensions and NCA offers particular strengths in timeliness, accessibility, interpretability and coherence, providing data when it is needed in a consistent format. Over time the quality of both the accounts and the underlying data improves overtime (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	Better integrating ILM & NCA
Process and governance	(1) Complexity (and inclusivity) increases with the number of stakeholders (2) Geographical areas relevant to ILM do not always align with jurisdictional boundaries (3) Managing multi-stakeholder relations is challenging	(1) Needs a process that brings the different data holders together (2) Needs formal arrangements for sharing and using data e.g. high-level agreements between agencies (3) Account users need to be involved in account design and construction so accounts are relevant and 'decision-centred'	(1) Senior representatives 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, but the start of an interactive process to both improve the accounts continuously and further embed their use in ILM processes.
Data and methods (information needed)	(1) ILM is inherently a process that needs to be fed by data and analysis (2) A more standardised approach to ILM data needs would likely assist with implementation (3) ILM requires data and methods that focus on multifunctional uses (like mosaics, agroforestry)	(1) Data is scattered between different agencies (2) Some key data could be 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	(1) Need to accurately represent the quality of data in information products (2) Need to have data quality assessment processes in place (3) Need to continuously improve data sources for the accounts
Challenges in project implementation	(1) Challenge of integrating data originating from various administrative classifications (e.g. districts, watersheds, economic growth zones) (2) Socioeconomic data often lacking, compared with remote sensing derived data (3) Dealing with spill-over effect beyond landscape boundaries	(1) Breaking down national level information to match landscape (regional or local) area (2) Scaling up local data to match regional or national data (3) Spatially representing information can create issues with confidentiality (security, ownership, etc)	(1) Defining boundaries for NCA that align with ILM regions (2) Gaining common understanding of terminology between ILM and NCA communities (3) Need to highlight existing NCA potentially useful to topical landscape decisions and produce NCA quickly to demonstrate usefulness to ILM community

Category	ILM perspective	NCA perspective	Better integrating ILM & NCA
		(4) Gaining an understanding of ILM and landscape-level decision-making terminology	
Funding and finance	(1) Lack of financing of ILM has been mentioned by a small number of governments and international organisations and NGOs (2) Challenge of connecting large investors and funds to small landscape interventions (3) Strong link to sustainable finance and corporate social responsible activities	(1) So far finance has been mentioned by a limited number of governments and international organisations and NGOs	(1) A compelling case can and should be made for pilot studies of applying NCA to ILM (2) Funding by national governments and international agencies is important initially (3) Funding can come from a range of international, national and local stakeholders. Joint funding may increase commitment to on-going production and use of accounts
Communication	(1) ILM is not a well-known term but the general concepts of it are recognised and understood by land managers (2) The concept is strong in illustrating interactions, either between activities in landscapes, or trade-offs in SDGs	(1) NCA is not well understood; need to address this early in account production (2) Need a plan for communicating NCA results to users and the general public (3) Diagrams, maps and charts work better than pages of tables	(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 (3) Good examples are important (4) Need to recognise the limits of data quality
Potential in decision making (use in policy cycle)	(1) So far mainly useful in the identification of issues, bringing stakeholders to the table, development and implementation of interventions at local level (2) Could be scaled up to be useful at higher levels (national and multi-country) (3) Strengthen role as participatory mechanism in achieving global goals for sustainable development	(1) So far mainly used in monitoring, review and problem identification at national level (2) Could be used at subnational levels and in other parts of the decision-making cycle with additional analysis and modelling (3) Could be used in policy design and implementation, mainly useful in the identification of issues, development and implementation of responses	(1) Monitor and review the sustainability of current land use and land management (2) Assess trade-offs between land use, management and investment decisions (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

Category	ILM perspective	NCA perspective	Better integrating ILM & NCA
Challenges in policy cycle use	(1) ILM developed as a bottom-up approach; 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, who deliberately do not extend into policy interpretation and analysis (2) Accounts are usually at the national level. We need landscape-level accounting 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. 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 Uganda.[23]

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 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 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)[24]. 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 2014.[25]

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

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[23] https://www.wavespartnership.org/en/forum-natural-capital-accounting-better-policy
[24] https://seea.un.org/content/seea-central-framework
[25] 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 identity[26]. In a landscape approach, stakeholders aim to balance and reconcile competing social, economic and environmental objectives[27]. 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 development.[28]

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?

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[26] https://ecoagriculture.org/publication/the-little-sustainable-landscapes-book
[27] https://www.pbl.nl/en/publications/the-landscape-approach
[28] https://ecoagriculture.org/publication/defining-integrated-landscape-management-for-policy-makers/