



# Accounting for Natural Capital in EU Policy Decision-Making

A WWF BACKGROUND PAPER ON POLICY DEVELOPMENTS

*“A genuinely sustainable strategy for economic development must take the health of ecosystems into account.”*  
José Manuel Barroso, 2010 ([http://europa.eu/rapid/press-release\\_SPEECH-09-197\\_en.htm](http://europa.eu/rapid/press-release_SPEECH-09-197_en.htm))

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Publisher: WWF Germany

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Text: Tomas Badura (CSERGE, University of East Anglia)

Editors: Alberto Arroyo Schnell (WWF European Policy Office),

Peter Torkler (WWF Germany), Günter Mitlacher (WWF Germany)

Contributions: Maya Todorova-Bankova (WWF Danube-Carpathian Programme),

Emily McKenzie (WWF UK – WWF US, The Natural Capital Project), Julia Steinert (WWF Germany),

Sebastian Godinot (WWF European Policy Office), Toby Roxburgh (WWF UK)

English proofing: Janice Weatherly, Andrea Kraljevic, Lucais Sewell

Layout: Thomas Schlembach (WWF Germany)

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## Executive Summary

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Greater awareness now exists of the fundamental importance of nature for human prosperity and well-being, and of the importance of accounting for nature's value in policy decision-making. **This WWF report explores recent trends and developments in natural capital accounting (which in this report is used as synonym for environment and ecosystem accounting), and provides a primer on some of the key concepts.** The primary focus is on national accounting by governments (as opposed to corporate accounting – another vital agenda, but which is beyond the scope of this report). It provides an outline of the relevant initiatives and processes related to ecosystem accounting in the EU and globally. It also addresses the related concept of ecosystem valuation, along with its key opportunities and challenges.

Interest in natural capital accounting is growing rapidly worldwide, driven to a large extent by increasing recognition that the current set of indicators used to guide public policy decisions (based predominantly on gross domestic product), does not adequately reflect our **dependence on nature** or the way in which consumption and production are continuing to erode the natural capital on which we depend. The **invisibility of natural capital can lead to sub-optimal decision-making**, which in some cases undermines long-term national progress. **There is an urgent need to go beyond GDP** in the choice of metrics that guide current policy decisions, and to integrate the value of natural capital into reporting and decision systems at the national, regional and local levels.

More and more, tools are being developed and used to reflect the values of natural capital in decision-making:

- » *Ecosystem valuation* techniques help assess the contribution of ecosystems to human well-being, especially at the local level. The valuation can be expressed in physical or monetary terms.
- » *Ecosystem accounting* techniques aim to aggregate information to produce statistical results, especially at the national level. They help to reflect the contribution of ecosystems to well-being at the national level, thereby ensuring these values are taken into account in policy decision-making.

**Ecosystem accounting is a tool that can significantly help to make better decisions on natural capital.** It aims to organise ecosystem data within an internationally recognised framework while also providing guidance for integration within economic data. Such a framework allows a range of indicators to be constructed to complement the current set of predominantly economic indicators. Ecosystem accounting complements other activities that assess the efficiency of natural resource use and the contribution of environmental goods to economic activities, and that provide a better understanding of the impact of economic activities on the environment.

Recent momentum has generated work on integrating ecosystem service values and natural capital in national reporting and accounting systems within the EU and globally. **A number of policy commitments – under the CBD and the EU Biodiversity Strategy** – directly require such integration. As a consequence, **a number of initiatives and actions related to these commitments have been developed** that aim to support the development of natural capital accounting. Examples are the World Bank’s WAVES initiative (Wealth Accounting and the Valuation of Ecosystem Services) or the EU’s MAES process (Mapping and Assessment of Ecosystems and their Services in Europe) for experimental ecosystem capital accounting.

There are likely to be significant benefits from organising ecosystem data within **an internationally recognised accounting framework**, and from developing guidance systems for value integration within economic data and decision-making. Such a framework allows a range of indicators to be constructed to complement the current set of predominantly economic indicators. It complements other activities that assess the efficiency of natural resource use and the contribution of environmental goods to economic activities, and that provide a better understanding of the impact of economic activities on the environment.

WWF believes that valuing and accounting for nature’s benefits and reflecting them in decision-making is a crucial part of global conservation efforts, alongside more traditional conservation work (such as the designation and management of protected areas and the establishment of environmental regulations). This report aims to contribute to ongoing debates on ecosystem accounting and complement traditional conservation work. WWF supports efforts that integrate environmental objectives into policy decisions and seize the current momentum in international and EU policy arenas.

WWF is a strong defender of the intrinsic value of nature. Therefore, WWF believes that valuation and accounting techniques complement other conservation tools that protect and maintain global biodiversity.

# I. Introduction - Background

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This report aims to provide key background information about the complex structures needed to advance the integration of natural capital accounting into aggregated reporting systems measuring society's wealth. A key priority is at the national level in public accounts, but there is also a growing recognition of the need to account for natural capital at the corporate level. This report also aims to stimulate discussion on ecosystem accounting, thus helping to bring scientific debate and policy processes closer together. It does not review methodologies and approaches of assessing and valuing ecosystem services. Rather, it points out existing literature and work that already provides thorough overviews.

A key reason why biodiversity loss and ecosystem degradation is escalating is that the value of their services is largely invisible to decision-makers in business and government. We need to calculate the value of natural capital because we cannot manage what is not measured.

## Losing nature – losing our well-being

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Since 1900, the world has lost almost 50% of its wetlands. 50% of its coral reefs have either been destroyed or severely damaged. 80% of commercial fish stocks are fully exploited, overexploited or depleted. If the current trend continues, no commercially viable fish stocks will exist by 2050. Around 85% of the world's agricultural land has been degraded due to unsustainable agricultural practices and 12 million hectares of land are lost to desertification annually. Overall, two-thirds of the world's water and land ecosystems are now significantly degraded. Even the most conservative estimates indicate that human-caused extinctions are 3-80 times higher than in pre-human times.

In short, the world's **natural capital is being lost at an alarming rate**. This is a very serious matter as the ecosystems services it provides underpins most human activities. Their loss is a threat to our very well-being and **results in tangible social and economic costs**. It is estimated that the cumulative loss of biodiversity and associated ecosystem services, such as the purification of water, carbon sequestration and pollination by insects, could amount to 7% of global GDP by 2050 annually. The European Commission estimates that the cost of not implementing nature conservation legislation in the EU will be €50 billion a year.

There is growing global consensus that a key driver of unsustainable development, climate change and biodiversity loss is that nature's value is not adequately reflected in government decision-making. It is vital that nature's 'value' is made more visible in the economy – by measuring it and fully accounting for it in government, business and consumer decision-making.

**Ecosystem accounting** and **ecosystem valuation** represent two important channels that help to amplify the discussion on mainstreaming nature's value in policy debate. Both support integrating relevant biodiversity and ecosystem information into the main data systems of society's accounts that are typically used as a primary basis for policy decision-making. Both help to highlight how nature supports the economy and individual well-being. Safeguarding nature, therefore, is in everyone's interests.

## Safeguarding nature's value: political commitments to valuation and accounting

Although the relationship between ecosystems and economics is not a new area of research, **it has been receiving increased attention in political debates, especially since the release of The Economics of Ecosystems and Biodiversity (TEEB) report in 2010.** The new emphasis is reflected in policy targets at global and EU levels, and in various related activities, such as the System of Environmental-Economic Accounting (SEEA) initiative, the World Bank's Wealth Accounting and the Valuation of Ecosystem Services (WAVES) initiative, the Mapping and Assessment of Ecosystems and their Services (MAES) of the EU Biodiversity Strategy to 2020 and the European Agency's Experimental Ecosystem Capital accounting framework (see section IV).

At the global and EU level, major policy commitments have been agreed upon to integrate the values of biodiversity and ecosystem services into various accounting and reporting systems.

At the Tenth Conference of the Parties to the **Convention on Biological Diversity** (CBD COP 10), held in Nagoya, Japan in 2010, the participants decided on the Strategic Plan for Biodiversity 2011-2020 including 20 Aichi Targets. Under *Strategic Goal A: Address the underlying causes of biodiversity loss*, Target 2 reads:

*By 2020, at the latest, biodiversity values have been integrated into national and local development and poverty reduction strategies and planning processes and are being incorporated into national accounting, as appropriate, and reporting systems.*

Target 2's objective is to ensure that the diverse values and benefits derived from the conservation and sustainable use of biodiversity are recognized and reflected in all relevant public and private decision-making. Including biodiversity values in national accounting and reporting systems would help give it greater visibility amongst policy-makers and contribute to the mainstreaming of biodiversity issues in various decision-making processes. Reflecting biodiversity values in strategies and planning processes of governments at all levels will help internalize the costs and benefits of the conservation and sustainable use of biodiversity

The **European Union's Biodiversity Strategy to 2020** places the EU on the right track to meet its own biodiversity objectives and global commitments. In it, the EU underlines the importance of biodiversity values, whilst also highlighting that valuing nature's potential will contribute to achieving a range of the EU's strategic objectives, such as resource efficiency and a low carbon economy. Within Target 2 of this strategy, Action 5 requires:

*Member States, with the assistance of the Commission, will map and assess the state of ecosystems and their services in their national territory by 2014, assess the economic value of such services, and promote the integration of these values into accounting and reporting systems at EU and national levels by 2020.*

In addition, in 2011, the European Parliament and European Council adopted the Regulation on European Environmental Economic Accounts. The current focus of this regulation is, in principle, in line with the SEEA CF (see section III). The regulation requires Member States to regularly report on the three areas/modules included in the Annexes (air emissions accounts, environmental taxes by economic activity and economy-wide material flow accounts) to the European Statistical Office (Eurostat). However, the regulation allows for new modules to be introduced, such as a module on ecosystem services, as explicitly mentioned in the regulation. This proposal would form part of the report on the implementation of the regulation to be prepared by the European Commission every three years (the first was released in December 2013).

This regulation paves the way to the introduction of ecosystem accounting in the EU and to the achievement of the goals set in the CBD and the EU Biodiversity Strategy.

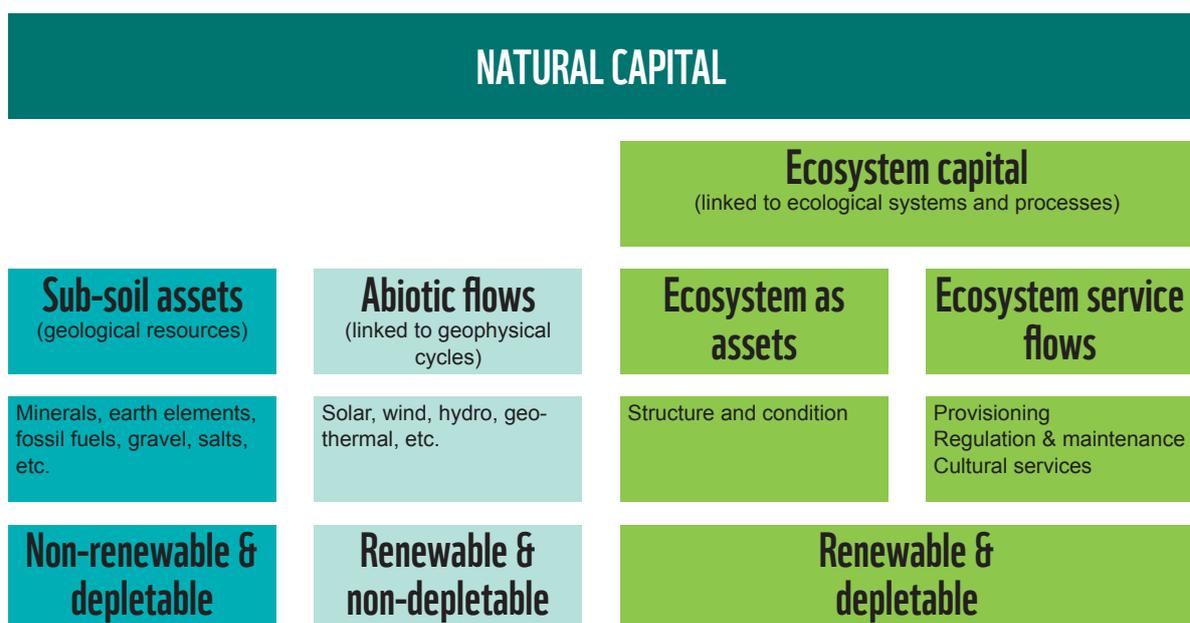
## Defining the key concepts

### Natural capital

Natural capital is a concept proposed by Pearce et. al. (1989) to underline the role of nature in the economy and human welfare, alongside other forms of capital (e.g. manufactured/man-made capital, human and social capital). Natural capital is the 'stock' of natural assets that yields a 'flow' of valuable services into the future and that provide benefits to humans.

A range of concepts of natural capital exist. The chart below represents four different components of natural capital as outlined in a recent technical report on the conceptual framework for Mapping and Assessment of Ecosystems and their Services in Europe (MAES, 2011).

### Components of Natural Capital



Source: European Environment Agency

Ecosystems – including our oceans, forests, rivers and wetlands - are a form of natural capital. The services they provide to humans are termed ‘ecosystem services’. Ecosystems are both renewable and depletable. To avoid undermining stocks, human uses/activity must be managed carefully. If this can be achieved, they will, theoretically, continue to yield ecosystem services in perpetuity.

Since the flow of services from ecosystems requires that they function as whole systems, the structure and diversity of the system are important components of natural capital. These forms of natural capital are characterised by some unique attributes – including threshold effects (e.g. tipping points), irreversibility (e.g. extinctions), acceptability limits (perceptions on what is acceptable loss) and intergenerational equity.

### Ecosystem services

The Millennium Ecosystem Assessment (MEA, 2005) defined ecosystem services as “the flow of benefits that people obtain from ecosystems”. From an economic point of view, ecosystem services can be seen as the ‘dividend’ that society receives from natural capital. Maintaining stocks of natural capital allow the sustained provision of future flows of ecosystem services, and thereby helps to ensure enduring human well-being.

Several international frameworks are available for classifying ecosystem services (including the MEA, TEEB and the Common International Classification of Ecosystem Services - CICES). A recent trend has emerged to develop common international frameworks and definitions of ecosystem services that support global conservation efforts. The CICES system is particularly tailored towards ecosystem accounting.

## ECOSYSTEM SERVICES

*Interconnections between people, biodiversity, ecosystem health and provision of ecosystem services*

## The benefits that people obtain from ecosystems

### Provisioning services

- food
- medicine
- timber
- fibre
- bioenergy



### Regulating services

- water filtration
- waste decomposition
- climate regulation
- crop pollination
- regulation of some human diseases



### Supporting services

- nutrient cycling
- photosynthesis
- soil formation



### Cultural services

- enriching
- recreational
- aesthetic
- spiritual



Living Planet Report, WWF (2012)

### **Natural capital accounting, environmental-economic accounting and ecosystem accounting**

Numerous concepts have been used in environmental and ecosystem accounting (ecosystem accounting, environmental-economic accounting, ecosystem capital accounting and natural capital accounting). The basic distinction made in this report is between environmental-economic accounting and ecosystem accounting as defined by the SEEA frameworks:

- » Environmental-economic accounting relates to data on individual environmental assets that directly benefit economic activity (e.g. land, mineral, timber and energy resources) as represented by the SEEA Central Framework.
- » By contrast, ecosystem accounting, as represented by the SEEA Experimental Ecosystem Accounts, considers environmental assets from an ecosystem perspective and relates to how individual assets interact within certain spatial areas to produce ecosystem services.

It should be noted that most provisioning ecosystem services are captured through environmental-economic accounting, such as species harvested for food, fibre, timber and energy. A more comprehensive range of ecosystem services that benefit people and create the necessary conditions for a wellfunctioning economy in the long term, such as water purification, flood and storm protection and pollination, are only captured through ecosystem accounting.

*This report uses the term 'natural capital accounting' to encompass both environmental-economic accounting and ecosystem accounting.*

## II. Ecosystem Valuation

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### The Intrinsic Value of Nature

“Value” is a multi-dimensional, context-dependent term that is difficult both to conceptualise and operationalise. A basic distinction should be made between instrumental (or extrinsic) and intrinsic values. Whereas extrinsic values are derived from a certain objective, goal or purpose that is being pursued, intrinsic values are non-derivative and are often associated with ethical considerations. That is, they are independent on the utility provided to humans, and do not refer to the value a certain object has ‘by (and of) itself’. For instance, a question like “What is the price of a human life?” helps to show intrinsic value. Economic valuation predominantly aims to capture the instrumental (extrinsic) values of ecosystems.

The concept of value in the context of the discussion presented throughout this report is anthropocentric because it awards value to nature only in relation to its human benefit. There is a danger that this could sideline the so-called ‘intrinsic value’ perspective, i.e. the value of nature for and by itself.

WWF believes that the “intrinsic value” of nature is a crucial element of valuation and should not be omitted.

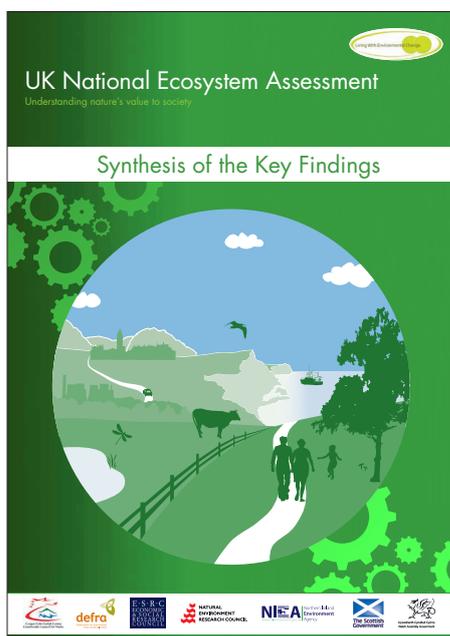
### Assessment and valuation of ecosystems

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Valuation of the benefits provided by ecosystem services is one of a range of tools that can help decision-makers take account of certain aspects of the natural environment’s value. It helps to demonstrate that the conservation of natural capital is essential to long-term economic security and human well-being, and that economic and environmental objectives can and must be aligned with governments and business.

The assessment and valuation of ecosystem service benefits are necessary steps for integrating policy and economic debates. They are necessary to assess the impact of political priorities under different development scenarios and to provide a common basis from which to compare alternative investment and development choices. They are also needed to measure associated losses/benefits (in terms of biodiversity and ecosystems) to the economy and society and to assess the benefits and costs between two or more alternatives.

**Hence, the assessment and valuation of ecosystem service benefits is essential for scientifically based and inclusive decision-making.** This approach is being increasingly recognised as important input into decision-making at differing levels, as can be seen by the expansion in the number and scope of such initiatives in recent years (see section IV).



## Natural capital and public policy-making: the UK experience

The UK has made considerable progress in developing the evidence base and policy tools to help mainstream natural capital, particularly in the last five years. In 2009, the UK National Ecosystem Assessment (UKNEA) began the first analysis of the benefits that the UK's natural environment provides to society and continuing economic prosperity. The initial 2011 UKNEA report provided a comprehensive picture of the state, value (economic and social) and possible future of terrestrial, freshwater and marine ecosystems in the UK.

It also identified a number of uncertainties, triggering a two-year follow-up phase whose report will be published in mid-2014. The follow-up phase is developing ways of better representing the values of natural capital in national accounts, filling evidence gaps (e.g. cultural ecosystem services), further analysing potential ecosystem service under future scenarios and developing and enhancing tools for the use of evidence by stakeholders (including government and businesses). The UKNEA has had a significant impact on UK government policy, and received widespread attention internationally. It strongly influenced the UK's 2011 Natural Environment White Paper (NEWP), in which the government pledged to be "the first generation to leave the natural environment in a better state than it inherited". The NEWP set out 92 policy commitments to help mainstream natural capital in decision-making, including the establishment of the Natural Capital Committee (NCC)<sup>1</sup>.

The NCC, the world's first such independent committee was set up in 2011 to advise the government on natural capital and help it to prioritise actions to support and improve them. Reporting to the UK Economic Affairs Committee (chaired by the Chancellor of the Exchequer), it has the opportunity to truly influence national economic policy.

The NCC published its 1st State of Natural Capital Report in April 2013, which stressed the need for a new framework to better measure and account for changes in natural capital, for the improvement in the valuation of changes to feed into decision-making processes and for the inclusion of natural capital into UK public and corporate accounts.

Its 2nd report, published in March 2014, set out evidence on the importance of nature to the economy, highlighted places where nature's benefits are at risk and demonstrated the advantages of considering natural capital when making decisions. It also proposed that the government and other interested parties develop a 25-year plan to improve natural assets in order to meet commitments in the NEWP and deliver substantial benefits for society.

The NCC continues to work with relevant UK government departments on the development of national natural capital accounts, and with businesses (including major landowners) to explore options for corporate natural capital accounting.

A number of other countries are also exploring similar models. Recent developments in Italy, for example, point towards the creation of a similar independent committee on natural capital.

<sup>1</sup> For more information see: <http://www.defra.gov.uk/naturalcapitalcommittee/>

## **Payments for Ecosystem Services (PES) – WWF’s related projects in the Danube-Carpathian region**

PES is an instrument linking the users of an ecosystem service with the provider. It is a deal that can be defined as a voluntary transaction in which a well-defined environmental service (ES) (or a land-use likely to secure that service) is ‘bought’ by an (at least one) ES buyer from an (at least one) ES provider, if and only if the ES provider secures the ES provision.

These approaches may be considered integrative because they aim to deliver environmental, social, and economic objectives. The development and application of such instruments requires sound knowledge based on data and information related to ecosystem functioning and flows of services, monetary valuation methods, as well as information on socio-economic conditions.

A demonstration project based on the PES approach in the lower Danube basin has been running since 2010 under the WWF Danube-Carpathian Programme. The project is being implemented in four pilot projects in Romania and Bulgaria and focuses on the aesthetic and biodiversity values of protected areas for the tourism sector; the sustainable management of biomass in wetlands to improve water regulation and water quality; and on the maintenance of biodiversity for commercial aquaculture ponds.

## **The technical and scientific basis of ecosystem valuation**

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The valuation of different socio-economic benefits from nature (economic and broader welfare value<sup>2</sup>) can be undertaken at three levels: qualitative (e.g. expert opinions, surveys, stakeholder discussions), quantitative (e.g. calculating the amount of water purified or tons of carbon sequestered in a forest) or monetary (e.g. calculating the avoided costs of water purification by artificial means).

The choice of approach depends on the time and resources available as well as on the type of benefit measured and the context in which the valuation results are being used. Overall, qualitative assessments are the least resource intensive, whereas determining monetary valuation often requires significant resources both in terms of time and expertise.

It is rarely possible to fully capture the value of nature’s benefits, nor is it always desirable. Humans value nature in many different ways, only some of which can be measured in monetary terms. Often it is helpful simply to express ‘values’ in qualitative or quantitative terms. The environment also has an intrinsic value beyond that attributed by humans. There will also always be certain assets which, by their nature, are impossible to value (e.g. unique or irreplaceable habitats and species).

<sup>2</sup> Economic value refers to the estimated monetary values for different stakeholders, values that consist of both ‘real’ economic advantages (e.g. revenue, profits, avoided costs etc.) and ‘theoretical’ monetary value (willingness to pay/accept approaches). Welfare value represents broader welfare and social values that are often difficult to estimate in monetary terms (e.g. health value, cultural value, etc.) (Ketunnen and ten Brink, 2013).

**Monetary valuation can help to provide an easy to understand measurement from which economy-oriented comparisons and analyses can be made.** However, the limits of the methodologies and the assumptions used when determining monetary values need to be explained and explicitly recognized. When it is applied, monetary valuation should be considered alongside other non-monetary approaches and values. Governments should adopt pluralistic approaches to valuing ecosystems to ensure these different types of value are taken into account in decision-making. Governments and practitioners should be clear about the limitations of valuing ecosystem services. There are significant methodological challenges that can lead to unsustainable decisions and outcomes. Where both monetary and non-monetary values are evident but unquantified, complementary approaches should be invoked such as participatory approaches, safe minimum standards or the precautionary principle.

In order to provide an assessment of ecosystem service benefits that goes beyond local scale or specific locations, results need to be aggregated and geographically scaled up. This involves gathering relevant primary valuation data and aggregating the results over the entire area being assessed. To keep the costs for regional and national assessments low, the benefit/value transfer method<sup>3</sup> may be applied.

Robust valuation studies, however, require a range of biophysical data and detailed knowledge and an understanding of an ecosystem and its benefits, whilst also acknowledging different types of uncertainties. Interdisciplinary expertise, especially in relation to ecology and economics, is needed. Physical assessments requiring ecological expertise of the ecosystem in question provide the scientific basis for any monetary valuation requiring economic expertise. But providing a physical assessment may be a challenge, given the complex functioning of ecosystems and the multifaceted relationships between people and nature.

The results of valuation studies are also very context dependent (e.g. TEEB, 2010; Kettunen and ten Brink, 2013; Bockstael et al., 2000 p.1386) and they may change in time and according to differing socio-political situations. In other words, the spatial dimensions of ecosystem service delivery are of particular importance when assessing the ecosystem benefits. For example, a forest in close proximity to a city is likely to be valued significantly higher in terms of recreation than a similar forest in an area of low population density, or in an area with lower standards of living. Similarly, water provisioning services are only relevant to downstream communities.

Valuation studies are increasingly being conducted with the use of Geographic Information System (GIS) tools, which can accommodate the spatial dimensions of ecosystem valuation.

<sup>3</sup> The *benefit transfer method* (also called the *value transfer method*) involves the application of values obtained in a particular context (TEEB, 2010; EEA, 2010). Strict assumptions should be applied to provide robust results. More elaborate approaches are being developed to use the value transfer method more robustly. For instance, if a large number of valuation studies are available it is possible to derive a value transfer function, which can provide a value for a given site based on its characteristics. Similarly, spatial value functions (i.e. values dependent on the location where the estimate is made) were used in the UK National Ecosystem Assessment.

### **Integrated Valuation of Environmental Services and Trade-offs (InVEST)**

InVEST is a family of modelling tools that map, measure and value goods and services gained from nature.

The tool produces a set of maps in either biophysical terms (e.g. the carbon sequestered) or monetary terms (e.g. the value of the sequestered carbon) and can accommodate differing data availability. This helps decision-makers to assess quantified trade-offs associated with alternative management choices, as well as to identify areas where investment in natural capital can enhance human development and biodiversity conservation.

*For more information, see [www.naturalcapitalproject.org](http://www.naturalcapitalproject.org)*

It is also important to recognise that ecosystem benefits in specific locations partly result from human activities and economic input. For example, the recreation benefits of protected areas are facilitated by the construction of walking trails, campsites and marketing. If this is not reflected in valuation results, the value of ecosystem services would be overstated.

Another challenge related to ecosystem valuation is the perception that it is likely to lead to the commercialisation of nature, that it, in other words, seeks to 'put a price tag on nature'. Indeed, the wide-scale implementation of monetary valuation may change human relationships to nature and needs to be acknowledged. The fact that some of the non-marketed benefits people obtain from ecosystems are not quantified means that they are associated with zero monetary value. This, in turn, means that decision-making is skewed towards marketable benefits, which often results in an over-emphasis of provisioning services at the expense of other services. These services provide longer-term benefits to the wider public and may also be of significant value, including the flood protection, water purification and carbon sequestration provided by forests<sup>4</sup>.

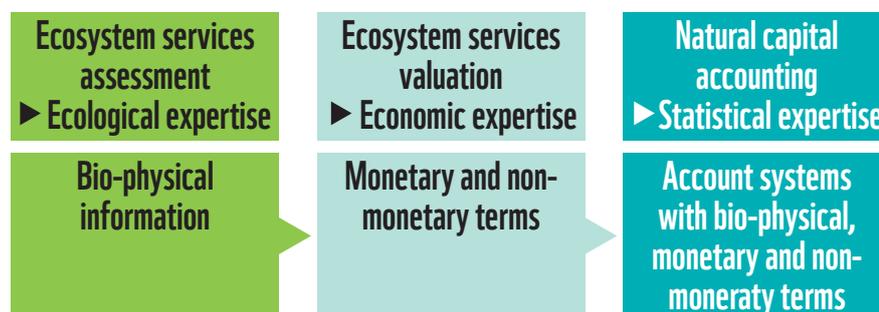
<sup>4</sup> For more information on the scientific and technical challenges related to ecosystems accounting, see Annex I of this report.

## Ecosystem valuation and accounting: distinct but related concepts

Ecosystem valuation and ecosystem accounting are distinct but, in practice, closely related processes. Ecosystem valuation involves **assessing values and attributing them to the benefits humans gain from the ecosystems services provided by natural capital**. Values are sometimes expressed in monetary terms, but not always. Valuations can be conducted at a range of spatial scales, from local (e.g. individual sites), to larger scale assessments, sometimes by aggregating the values over regions or other scales.

**Ecosystem accounting represents a system of organising ecosystem related data, such as on a national or organisational scale.** Its main aim is to provide a framework for data organisation to assess the relationship between the economy and ecosystems. Ecosystem accounting helps to improve the management of natural capital and provide a macro perspective of ecosystems and their contribution to national well-being.

Valuation can provide quantitative or monetary estimates that may be fed into national accounting systems; and on the other hand, while accounting provides a systemised approach to compiling, organising and reporting these values over a regular period of time so that they can be analysed to suit a variety of purposes (policy or economy).



*Todorova-Bankova M. & Guenter Mitlacher, WWF*

## III. Ecosystem Accounting

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The lack of prices and property rights associated with ecosystem services has resulted in externalities in which uncompensated or non-agreed costs are imposed on nature. The negative impacts on biodiversity and ecosystems from such externalities are severe and rapidly escalating.

*As one of the 16 priority actions required for living within the means of one planet, WWF's Living Planet Report has identified the need to integrate social and environmental costs of production and consumption over long timeframes into standard national and corporate accounting and reporting methodologies.*

### The importance of economic accounting for environment, biodiversity and ecosystems

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**Current policy-making processes and decisions are predominantly guided and/or supported by a System of National Accounting (SNA).**

The SNA is an internationally agreed upon statistical standard that provides guidelines for measuring economic activity. It provides a set of concepts, definitions, classifications and accounting rules that allow a coherent, consistent and integrated set of macroeconomic accounts. SNA also provides a basis for deriving a set of economic indicators (including gross domestic product (GDP), net national income (NNI), and savings) – all of which are considered important for measuring countries' economic performance and policies.

**The SNA does not, however, provide any information on the state of the environment, ecosystems or biodiversity.** Additionally, it does not monitor the impacts of economic activities on natural capital, nor reflect the interdependencies of the economy and the environment. Furthermore, GDP only provides a snapshot of the current situation and offers very limited information on long-term sustainability. Neglecting the methodological assumption of GDP measurement leads to misinterpretations on societal progress and therefore encourages short-term growth-oriented decision-making instead of long-term decisions in the context of sustainable development.

**In other words, policies guided purely by GDP measurements are likely to give a wrong impression of an economy's and a society's progress.**

For example, while heavy deforestation may contribute to strong economic growth by GDP, it may also be undermining the medium or long-term sustainability via increased soil erosion or loss of water regulation functions such as water quality and flood protection. It has been argued that high GDP growth rates in China created a number of social and environmental problems such as environmental degradation and pollution, which in turn led to economic losses estimated to be over 10% of gross national income in 2008.

It is therefore extremely important to address the interdependence of the economy and the environment within SNA measurements. This was **already acknowledged more than 20 years ago by the international community** following the release of a report by the World Commission on the Environment and Development in 1987 and Agenda 21, the main outcome of the first UN Conference on Environment and Development, held in Rio de Janeiro in 1992.

As a result, in 1993, a lengthy **process was started to prepare an amendment for the SNA on environmental issues** intended to reflect the interdependencies between the economy and environment. The process began with the release of the Handbook of National Accounting, Integrated Environmental and Economic Accounting (UN, 1993). A revision process led to the latest version, the **System of Environmental-Economic Accounting Central Framework (SEEA CF)**, which was accepted as an international statistical standard on the 12th of February 2012 at the forty-third session of the United Nations Statistical Commission (UNSC).



Development of the System of National Accounting –  
Todorova-Bankova, M. (2013), WWF

The SEEA Central Framework (SEEA CF) **will be reinforced by two other initiatives, namely the SEEA Experimental Ecosystem Accounts (SEEA EEA)** and the SEEA Extensions and Applications, which are currently being finalised. Broad agreement has already been reached on the SEEA CF, which has been accepted as a statistical standard. The two additions to the SEEA will not – at least not in the foreseeable future – be accepted as statistical standards.

### The System of Environmental-Economic Accounting (SEEA) and the Experimental Ecosystems Accounts (SEEA - EEA) initiative

The **SEEA CF is the first international standard for environmental-economic accounting**. Using the systems approach (i.e. looking at interacting systems rather than isolated phenomena), the SEEA CF aims to organise environmental and economic information to produce internationally comparable statistics on the relationship between the environment and the economy. By adopting accounting concepts, principles, rules and most of the language and terminology of the SNA, it facilitates integrated data reporting and analyses between both systems.

An interdisciplinary approach is required to integrate various information on the environment and the economy under the SEEA CF. In a single measurement system it brings together data on water, waste, minerals, timber, fish, land ecosystems, soil, energy, pollution, consumption, production and accumulation.

A crucial aspect of the **SEEA is that it aims to present information in both physical and monetary terms**. Accounting for environmental stocks and assets in physical terms is significantly different from the SNA approach. Given that not all of the environmental information can be presented in monetary terms, the SEEA CF's capacity to present information in a combined form is critical to integrating the environmental and economic data.

In general, indicators derived from the SEEA CF will assist in answering the following questions:

- » What resources does the country depend on?
- » How efficiently are these resources being used?
- » Who benefits from natural resource use?
- » What is the impact on the environment and other economic sectors?
- » How does the depletion of natural resources affect a nation's real income?
- » Are trends in the production and consumption of resources sustainable?
- » What is the impact of policy instruments?

### **The SEEA Experimental Ecosystem Accounts**

The SEEA CF is another foundation from which to develop specific thematic statistical publications. Significant progress has already been made in relation to water, energy, and fisheries (see Annex II for more information).

The **SEEA Experimental Ecosystem Accounts (SEEA EEA) complements the SEEA CF** but focuses on ecosystems, rather than on individual environmental assets. The SEEA EEA uses the following definition of ecosystems “...dynamic complex of plant, animal and micro-organism communities and their non-living environment interacting as a functional unit”<sup>5</sup>. **Ecosystem services therefore represent the central element of ecosystem accounting** as they provide the link between ecosystems and the benefits used by people.

The **SEEA EEA explicitly links ecosystems to economic and other human activity**, in terms of the services provided by ecosystems as well as the impact of economic activities on ecosystems and their capacity to maintain these services. An accounting framework is used to relate the stocks (ecosystem assets) to the flows (ecosystem services) and other economic, environmental and social information. Furthermore, the SEEA EEA recognises many un-priced benefits obtained from regulatory and cultural services, including carbon sequestration, water purification and cultural and amenity services.

Questions that can be answered using the SEEA EEA include:

- » Which ecosystems generate which ecosystem services?
- » What is the extent of the contribution of ecosystem services to economic and other human activities?
- » Which ecosystems are in the best condition and which are the most degraded?
- » What changes have occurred over time and what has been the impact on the generation of ecosystem services?
- » What monetary values might be attached to particular ecosystems?

<sup>5</sup> Convention on Biological Diversity (2003), Article 2, Use of Terms.

## IV. Commitments and Policy Processes Related to Ecosystem Accounting

A number of policy initiatives and processes at the global, EU, and national levels have been launched which promote development and implementation of natural capital accounting. Some of these concern ecosystem accounting directly (e.g. they support the implementation of ecosystem accounting), whilst other initiatives are indirectly connected to ecosystem accounting (e.g. they indicate where ecosystem accounting might play a supporting/facilitating role).

### Initiatives at the global level

The **UN System of Environmental-Economic Accounting (SEEA)**, as highlighted in section III, represents a direct effort to set up an internationally recognised framework for ecosystem (SEEA EEA) and environmental economic accounting (SEEA CF). At a technical level, the SEEA process is likely to serve as an umbrella framework for other initiatives aiming to experiment and/or implement environmental economic and ecosystem accounting systems.

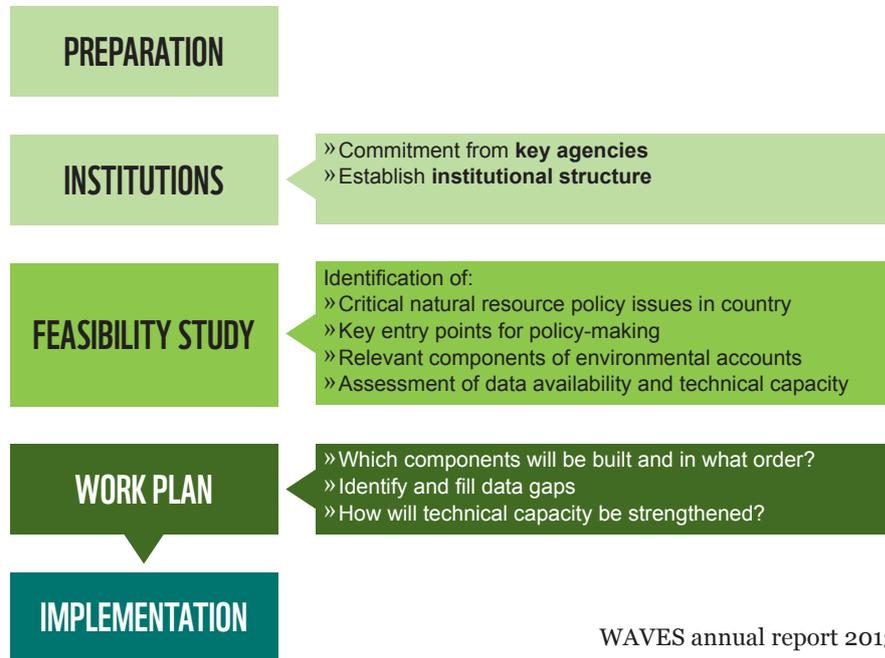
The **World Bank's Wealth Accounting and Valuation of Ecosystem Services (WAVES)** partnership directly supports the implementation of SEEA, whilst also helping to develop methodologies for measuring ecosystem services (WAVES Annual Report 2013). Set up in 2010 at the CBD COP 10 in Nagoya, Japan, WAVES includes several UN agencies, national governments, NGOs (including WWF), academia and other institutions as partners or supporting organisations. WAVES aspires to build a global platform for training and knowledge sharing and to support international work on natural capital accounting. It currently supports the implementation of natural capital accounting in five countries (Botswana, Colombia, Costa Rica, Madagascar and the Philippines) in line with each country's needs, capacities and priorities.

#### **WAVES partnership: status and a brief country example (Botswana)**

The World Bank's WAVES initiative is a five-year global programme to implement natural capital accounting in a range of (both developed and developing) countries. Its first priority is to implement the SEEA using internationally recognised methods. The second priority is to help develop an internationally accepted methodology to measure ecosystem services. It aspires to create a community that shares experience and raises awareness on the importance of natural capital accounting.

Since its launch in 2010, it helped initiate and support the implementation of ecosystem accounting in five developing countries. Having completed the preparatory phase of the programme, the WAVES partner countries are currently starting to implement their work plans (see chart below).

## WAVES Country Roadmap for Implementation



With the support of WAVES, Botswana is entering the implementation phase of its work plan and already presented its 2010 – 2011 accounts for water in November 2012. Given the relative scarcity of water in Botswana, the water accounts allow the government to assess the water-intensity of different economic sectors and identify which sectors should be targeted for growth, opportunities to increase water efficiency and options for decoupling growth from water consumption.

The implementation of natural capital accounting in Botswana was preceded by a wide consultation process with a range of stakeholders, involving workshops and individual meetings, to develop options for a detailed work plan.

The United Nations Conference on Sustainable Development, **Rio +20**, gave significant support to natural capital accounting initiatives and related efforts. Fifty-seven countries and the European Union supported a communiqué calling on governments and international institutions to strengthen the integration of natural capital accounting into national accounting systems. The Rio +20 conference’s final document - “**The Future We Want**” - stated the need to complement GDP with other measures of progress.

The **Natural Capital Declaration**, part of the UNEP Financing Initiative, is a commitment from banks, investors and insurance firms to change their business models to reflect the relevance of natural capital for the financial sector. More than forty CEOs of banks, investors and insurers worldwide have signed the Declaration, and supporters include diverse stakeholders, such as NGOs like WWF.

Recognising the socio-economic value of nature also figures in major global initiatives, such as the **UNEP Green Economy** or **OECD Green Growth Strategy**. Valuing nature's benefits should play a key role in any strategy that facilitates a transition to a green economy. Similarly, valuing natural capital and better managing environmental assets can help to promote the OECD's Green Growth Strategy. Specifically, the OECD advocates that the SEEA framework should be used where possible to devise green growth indicators (UNCEEA, 2013).

Furthermore, the international community is increasingly recognising the need to move **beyond GDP** in measuring society's progress. Ecosystem (and environmental-economic) accounting will play a crucial role in this process by integrating economic and environmental data to reflect wider dimensions of progress and provide new indicators for policy, monitoring and evaluation purposes (see Chapter III). Similarly, natural capital accounting is likely to support initiatives aiming to reflect wider dimensions of wellbeing (including natural capital), such as the OECD Better Life initiative or the Inclusive Wealth Report initiative.

Similarly, the **Gaborone Declaration** of ten African countries in 2012 has also given support to the integration of natural capital into accounting systems.

In terms of providing better information for decision-making, the **Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES)** works on the science-policy interface. In 2013, at the Platform's second plenary meeting, governments decided on a 4-year work programme, which comprises a methodological assessment on the conceptualization of values of biodiversity and nature's benefits to people and the development of a preliminary guide on the subject. This assessment is designed to support the development and application of political instruments. The guide is scheduled to be completed by the end of 2015, the development of policy instruments by 2016 or 2017.

The WAVES initiative currently supports the implementation of natural capital accounting in five selected countries, all Parties to the Convention on Biological Diversity (CBD). However, **all 194 Parties to the CBD are obliged to integrate Target 2 of the Strategic Plan** (see Chapter I) while revising and updating their National Biodiversity Strategy and Action Plan (NBSAP). Once the NBSAPs are updated, the implementation process of Aichi Target 2 must begin. In this context, countries may build on the experiences of WAVES and other information.

## Initiatives at the EU level

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EU initiatives and agencies play an important role in the development of natural capital accounting systems. The European Environment Agency (EEA) and Eurostat took the initiative, contributing to the SEEA revision process and the development of methodologies for ecosystem accounting at the EU level. Whereas Eurostat leads the work on environmental-economic accounting (SEEA CF), the work on ecosystem accounting (SEEA EEA) is mainly led by the EEA, with support from Eurostat. In particular, the **EEA developed an experimental framework for ecosystem capital accounting in Europe** in 2011 to test the feasibility of ecosystem accounting. The framework provided input for the preparation of SEEA Volume Two (see the box below for further details).

Furthermore, the EC Working Group on **Mapping and Assessment on Ecosystems and their Services (MAES)** has been established under the EU Biodiversity Strategy's Common Implementation Framework. The work of this group is key for implementing the EU Biodiversity Strategy and is strongly linked to the work on ecosystem accounting. The recently released MAES Report 2013 provides a basis for a conceptual framework and a toolkit to ensure coherent mapping and assessment across Europe and different scales. A series of pilot studies in EU Member states has been developed, including one on natural capital accounting. As recognised during a recent workshop for the pilot study (in Copenhagen in June 2013), it is important to seize the momentum that currently exists in the policy arena and deliver a number of outcomes in a short time period.

According to the **EU regulation on Environmental Economic Accounts** that was adopted in 2011, the European Commission can propose additional modules to be added to the required once-every-three-year reports. Such potential modules include water accounts, forest accounts and, importantly, ecosystem services accounts. Three additional modules have already been suggested in the recent EC report on the implementation of the Regulation (from December 2013): one for air emissions accounts, one for environmentally related taxes by economic activities and one for economy-wide material flow accounts. The next opportunity for adding new modules are 2016 and 2019.

### **EU Experimental Ecosystem Capital Accounting**

Since 2009, the European Environment Agency (EEA) has been developing a 'fast-track' experimental version of simple ecosystem capital accounting that tests the feasibility of and options for the implementation of ecosystem accounting within the EU based on the use of existing data and statistics. The first document, 'An Experimental Framework for Ecosystem Capital Accounting in Europe', was released in 2011. The document outlines the design for an ecosystem capital accounting framework that highlights the relationships between accounting tables and systems and key indicators of ecosystem-economy interactions. Within this context, ecosystems are considered to be a form of capital that delivers a range of services. These services are, in turn, dependent on the regeneration of ecosystem capital, which is also influenced by the consumption of ecosystem services.

Three types of ecosystem service are included in the EEA accounting system: accessible biomass/carbon, accessible water and available regulating and cultural services. 'Accessible' refers to the share of the total or available resources that can be used without damaging ecosystem capital capacity. It should be noted that biophysical accounting forms the basis of this framework.

In 2007, the European Commission, the European Parliament, the Club of Rome, the OECD and the WWF hosted the high-level conference Beyond GDP. Subsequently, the European Commission launched **the communication "GDP and Beyond: Measuring Progress in a Changing World"** in 2009. In a recent progress report, the EC includes work on ecosystem accounting under the SEEA.

## Other policy processes related to natural capital valuation

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Ecosystem and environmental valuation would provide internationally comparable environmental datasets. This could support a number of international and European goals and strategies, as well as international commitments.

At the global level, ecosystem valuation might help to support policies aiming to mitigate and adapt to climate change, such as the Reducing Emissions from Deforestation and Forest Degradation (REDD+) initiative under the United Nations Framework Convention on Climate Change (UNFCCC). Similarly, it is likely that ecosystem and environmental economic accounting might feature in the development of the Sustainable Development Goals, the establishment of which was agreed on during the Rio +20 Conference.

At the European level, a number of strategic goals and targets within the European Union's ten-year growth strategy can be supported by implementing ecosystem (and environmental-economic) valuation and accounting. Most notably, ecosystem valuation and accounting has been identified as a relevant component of the EU flagship initiative for a resource-efficient Europe. Recent policy recommendations by the European Resource Efficiency Platform highlighted the need to mainstream natural capital accounting methodologies for countries and businesses.

## V. Conclusions and Recommendations

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Based on this report, the following conclusions and recommendations can pave the way for a better evolvement of natural capital accounting and reporting systems, with a particular focus on the EU process:

### Recommendations regarding concept development

- » Biodiversity and ecosystem valuation is an anthropocentric approach that focuses on human benefits. However, this should not undermine the importance of **the intrinsic value of nature**, which needs to be adequately acknowledged in accounting and reporting system as well as in policy decision-making.
- » A number of countries have started the implementation process on environmental-economic accounting, with some also experimenting with ecosystem accounting. Ongoing discussions would **benefit from an analysis of both approaches and from sharing existing experience with reporting and accounting systems at various levels**. Sharing experiences more regularly and intensively can assist in refining existing systems and speed up future implementation.
- » Given the tight timeline for achieving global and EU commitments, countries should **make use of already available data** that in many cases can provide the basis for establishing biophysical accounts, which is the basis of ecosystem accounting.
- » A particular challenge is **accounting for ecosystems in monetary terms**. To create monetary accounts, market valuation should be used, but functioning markets do not exist for most ecosystem services and related goods. Market valuation is, therefore, not a means by which to construct monetary accounts for the majority of ecosystem services. The scientific basis for the development of monetary ecosystem accounts needs to be improved.
- » Data integration and harmonisation pose a significant challenge and require considerable expertise. This is why it is important to **facilitate co-operation between different institutions that are already collecting relevant data** for different purposes, such as environmental agencies and statistical offices. The aim should be to provide easily available datasets serving a range of purposes, including monitoring, research and communication.

## Recommendations to the EU

- » Developing and implementing an adequate policy framework for ecosystem valuation and accounting requires strong political will. **The European Commission should play a key role** in this context by delivering and promoting an appropriate accounting system and by making use of existing positive examples such as the UK Natural Capital Committee and the National Ecosystems Assessment process.
- » At the EU level, several related processes are ongoing with overlapping goals in environmental and ecosystem accounting (MAES, Beyond GDP Communication, and Regulation on environmental economic accounts). WWF recommends enhancing the **co-ordination between these parallel processes**, as well as with related processes at the global level (such as WAVES, SEEA and the Natural Capital Declaration), with the aim of identifying synergies and avoiding duplication of effort.
- » **The EU regulation on environmental economic accounts is a potential channel** to introduce ecosystem accounting in the EU. The EC should therefore propose a new module for ecosystem accounting. Proposing such a module before 2020 is the right way to step up the implementation of the EU commitments made at the global and European levels.

Natural capital accounting is a crucial tool to assess and manage the economy's dependency on the environment. It also helps to raise awareness of the role that nature plays in human well-being, especially if it is organised under an internationally recognised standard.

Although ecosystem accounting is still in an experimental phase in many countries, the processes need to speed up significantly to achieve existing commitments and targets by 2020.

## List of Acronyms

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CBD – Convention on Biological Biodiversity

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CICES – Common International Classification of Ecosystem Services

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COP – Conference of the Parties

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EC – European Commission

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EEA – European Environment Agency

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EP – European Parliament

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EU – European Union

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Eurostat – The statistical office of the European Union

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GDP – Gross Domestic Product

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GLOBE – Global Legislators Organisation

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IPBES – Intergovernmental Platform on Biodiversity and Ecosystem Services

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MA – Millennium Ecosystem Assessment

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MAES – Mapping and Assessment of Ecosystems and their Services

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NGO – Non-Governmental Organisations

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NBSAP – National Biodiversity Strategy and Action Plan

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NNI – Net National Income

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OECD – Organisation for Economic Co-operation and Development

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PES – Payments for Ecosystem Services

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REDD – Reducing Emissions from Deforestation and Forest Degradation

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SEEA – System of Environmental-Economic Accounts

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SEEA CF – System of Environmental-Economic Accounts Central Framework

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SEEA EEA – System of Environmental-Economic Accounts Experimental Ecosystem Accounts

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SNA – System of National Accounts

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TEEB – The Economics of Ecosystems and Biodiversity

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UK – United Kingdom

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UK NCC – United Kingdom Natural Capital Committee

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UK NEA – United Kingdom National Ecosystem Assessment

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UNCCD – United Nations Convention to Combat Desertification

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UNCCEA – United Nations Committee of Experts on Environmental-Economic Accounting

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UNFCCC – United Nations Framework Convention on Climate Change

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UNEP – United Nations Environmental Programme

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WAVES – Wealth Accounting and Valuation of Ecosystem Services

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WWF – World Wide Fund for Nature

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## Annex I - Challenges of and for Ecosystem Accounting

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**Data collection**, organisation, and harmonisation are significant challenges, particularly given the spatial dimension of environmental assets and ecosystems. The use of Geographic Information System (GIS) tools is needed to reflect the spatial variability in ecosystem service provision. Nonetheless, a great part of the biophysical data needed for ecosystem and environmental-economic accounting is already being collected, though without monetary values. As such, a coherent and co-ordinated effort between different institutions is required to support the development of environmental economic and ecosystem accounts through the collection, sharing, harmonisation and standardisation of data.

Another challenge is to **link ecosystem services to beneficial areas**. In other words, as ecosystem services are strictly defined as benefiting people, there is a need within accounting systems to link potential ecosystem services with actual beneficiaries. This is particularly difficult in the case of regulatory services where the beneficiaries are located in different spatial locations.

A particular challenge is **accounting for ecosystems in monetary terms**. To create monetary accounts consistent with SNA principles, market valuation should be used, yet functioning markets do not exist for most ecosystem services and related goods. Market valuation, therefore, is not a suitable means by which to construct monetary accounts for the majority of ecosystem services, especially for regulatory services. Other methods, coupled with the use of value transfer, could in theory be used to estimate the monetary value of ecosystem services for accounting purposes, although more research is needed to assess the consistency of other approaches to ecosystem valuation under SNA principles<sup>6</sup>. The SEEA EEA, the most advanced methodology developed to date, does not provide a means for constructing monetary accounts for the majority of ecosystem services and instead places the emphasis on biophysical accounts. It should be noted that market valuation (i.e. calculating values from prices in the existing markets) often considers only the potential profit or wealth that might accrue to economic actors, and takes into account single production functions (which provide the main benefits) in isolation. For assets with multiple functions (i.e. ecosystems) that provide a range of public benefits, market valuation does not capture all the relevant values when assessing options for optimal decision-making. Furthermore, values may change when resources become scarce or carbon stocks drop, and these changes can have a large impact on valuation if they figure in to economic decision-making.

<sup>6</sup> See, for instance, ten Brink and Mazza, 2013. It should be noted that the main problem lies in the fact that whereas market values are used within accounting systems, many of ecosystem valuation methods aim to estimate welfare values. These are two different types of values and it is questionable whether they can be combined.

Given the practical application of monetary values in policy-making, the goal is to support the development of monetary ecosystem accounts. Indeed, physical accounts (e.g., physical flow accounts for water, energy and materials and asset accounts for timber, soil and timber resources) often provide sufficient information for decision-making. If accounts are only presented in physical terms, however, the need for a more complex decision-making process may limit adoption by policy-makers. Or as the comment on the SEEA EEA consultation draft from the UK Natural Capital Committee cautions, the current state of ecosystem accounting (i.e. the predominant emphasis on biophysical accounting) may not put enough natural capital at the heart of policy-making and risk assessments, “placing this potentially important work programme [i.e. natural capital accounting] on the periphery of policy-making, in many countries from the outset”<sup>7</sup>.

Finally, it should be noted that proper governance, transparency and institutional set-up is a precondition for the success of many of the efforts related to natural capital accounting. Given the requirement for co-ordination between different bodies and the need for appropriate expertise and capacity building, financial support will be needed, especially for developing countries.

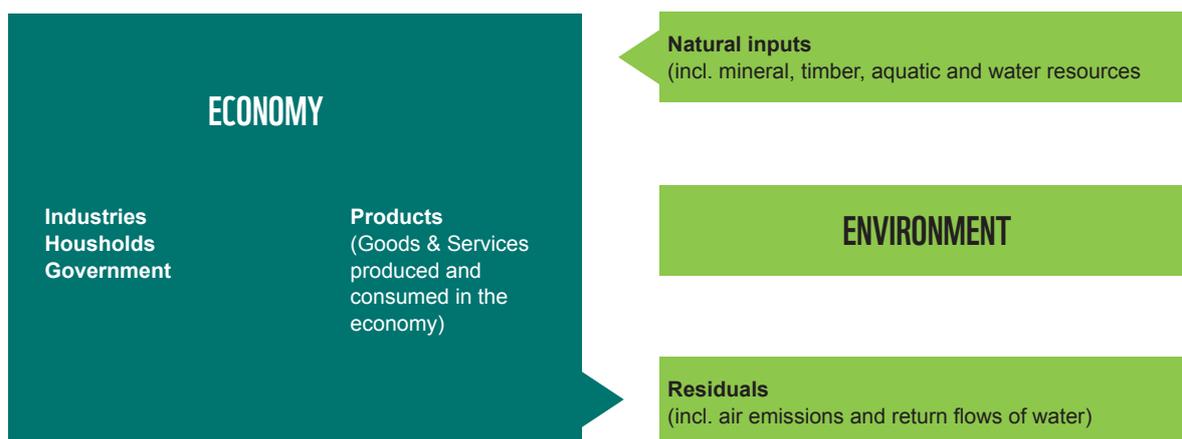
<sup>7</sup> Department of Economic and Social Affairs, Statistics Division, United Nations. Comment form for the Consultation Draft (15 January 2013). [http://unstats.un.org/unsd/envaccounting/seeaev/GCCComments/EEA\\_UK2.pdf](http://unstats.un.org/unsd/envaccounting/seeaev/GCCComments/EEA_UK2.pdf)

## Annex II - The SEEA CF and the SEEA EEA

### Areas of measurement

In general, the SEEA CF focuses on measuring three areas: 1) physical flows; 2) stocks of environmental assets; and 3) economic transactions and activities related to the environment. Measurement in these areas is then translated into an interconnected system of accounts and tables, as is the case with the SNA.

**1) Physical flows** describes the flows of material and energy into and out of the economy as well as within the economy itself. Flows can broadly be divided into three areas: **natural inputs** (flows from the environment to the economy); **product flows** (flows within the economy); and **residuals** (flows from the economy to the environment). These areas are illustrated in the figures below:



*With natural environmental inputs (e.g. raw materials and water), goods and services (e.g. cars) are produced within the economy. These are then consumed (e.g. by households and industries) within the economy. Residuals and waste from the production process (e.g. emissions and wastewater) and from consumption (e.g. old products and packaging) are then discharged into the environment. Source: System of Environmental-Economic Accounting - Central Framework, (2012).*

**2) Stocks of environmental assets accounting** measures the changes in stocks of environmental assets<sup>8</sup>, both in monetary and physical terms. In the SEEA CF environmental assets are individual components of the environment that provide materials and space for all economic activities (e.g., timber and energy and land and water resources). They function as natural inputs into the economy and are used by households and enterprises.

<sup>8</sup> Environmental assets within the SEEA CF are defined as “the naturally occurring living and non-living components of the Earth, together comprising the bio-physical environment, that might provide benefits to humanity.”

### 3) Economic transactions and activities related to the environment

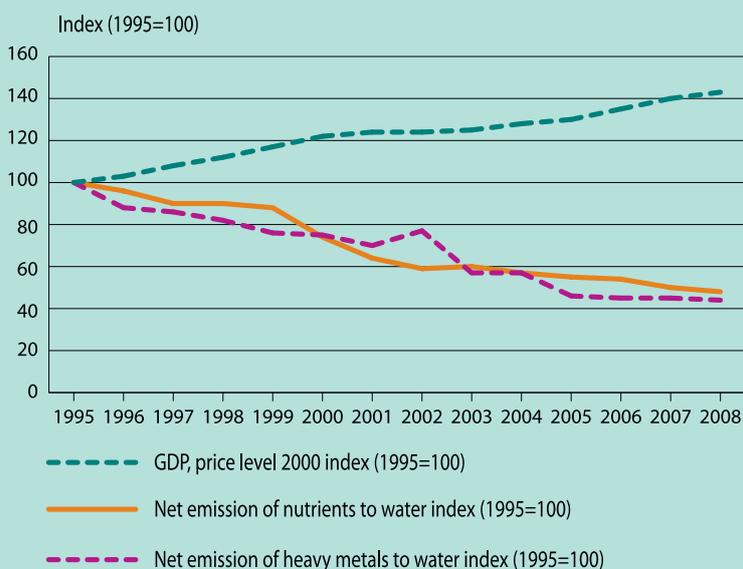
include financial transactions, such as taxes and subsidies, expenditures on environmental protection, resource management and their production, such as devices that aim to reduce air or water pollution. Such expenditures and transactions can be presented, say, in environmental protection and expenditure accounts.

#### Priority subsystems of the SEEA (water and energy)

Currently two priority subsystems (SEEA Water and SEEA Energy) have been identified by the United Nations Statistics Division as priorities for SEEA implementation. (Significant progress on the development of the water accounts has been made in some countries such as the Netherlands and Australia. See the box below.) These subsystems, which are closely linked to the SEEA CF, are currently under development and follow specific topical guidance<sup>9</sup> for collecting data and populating accounting tables.

#### Water accounts in the Netherlands

Netherlands has developed water accounts for several years. Despite a relative abundance of water, the Netherlands faces the challenge of water pollution from fertilizers and heavy metals. The accounts help to monitor this pollution and can differentiate between intensities of water pollutant emissions across industrial sectors. For instance, in 2008, fisheries and water transport were identified as being responsible for relatively high emissions of heavy metals to the water. As a further example, the figure below shows the decoupling of net emissions from economic growth.



Source: *Monitoring Framework for Water: Briefing Note on The System of Environmental-Economic Accounts for Water (SEEA-Water) and the International Recommendations for Water Statistics (IRWS)*  
[http://unstats.un.org/unsd/envaccounting/WWAP\\_UNSD\\_WaterMF.pdf](http://unstats.un.org/unsd/envaccounting/WWAP_UNSD_WaterMF.pdf)

<sup>9</sup> These include the International Recommendations for Energy Statistics (<http://unstats.un.org/un-sd/energy/ires/default.htm>) or the International Recommendations for Water Statistics (<http://unstats.un.org/unsd/envaccounting/irws/>).

### Basic model of ecosystem stocks and flows

A model linking ecosystem assets and ecosystem services (i.e. stocks and related flows) lies at the heart of the SEEA EEA. Stocks are accounted for as spatial areas representing ecosystem assets (e.g. forests and wetlands), with each ecosystem showing a range of ecosystem characteristics (e.g. land cover, climate and biodiversity). Two types of flows are shown within the SEEA EEA: flows between and within ecosystems, which represent both ongoing ecosystem processes and dependencies between different ecosystems; and flows from ecosystems that benefit human activities, which represent ecosystem services (e.g. carbon storage and water purification).

### Parallel between the CF and the EEA

Although the SEEA CF is designed to accommodate environmental data, it was not designed to account for data on ecosystem services or natural capital. Presenting information on these specific areas is the main goal of the extension to the SEEA CF, the SEEA EEA. A key aspect of the EEA is its ability to account for ecosystems and the services they provide in physical terms, while also presenting information in monetary terms. Physical accounting provides a quantitative assessment of ecosystem and ecosystem services, and may be sufficient for accounting purposes. But quantitative assessments can also provide a basis for monetary valuation. In stark contrast to the SNA or SEEA CF, which consider environmental assets in terms of their individual environmental components (e.g. minerals, timber and water), the EEA provides a complementary perspective on environmental assets. It is hoped that reflecting such non-marketed benefits and linking them to economic and environmental information (e.g. SNA- and SEEA CF-related information) will contribute to improved decision- and policy-making.

### Comparison between the SEEA CF and SEEA EEA

Feature	SEEA CF	SEEA EEA
Reporting interactions	Environment-Economy	Ecosystem-Economy Ecosystem-Ecosystem (trade-offs)
Assets	Individual environmental components serving as natural inputs (e.g. water, timber, energy)	An ecosystem (forest, wetland, river, etc.), ecosystem assets and availability in the form of a stock
Flows	Environmental-economy (inputs) Economy-economy (products) Economy-environment (wastes)	Ecosystem-ecosystem (processes) Ecosystem-human activities (ecosystem services)
Measurements	Physical and monetary	Physical and monetary
Statistical standard	Yes	No

Despite significant developments in the area of ecosystem accounting in recent years, there is still insufficient understanding of how to incorporate ecosystem services within the accounting systems such as the SNA or SEEA<sup>10</sup>.

### **Suggested policy applications of SEEA, SEEA-EEA and ecosystems accounting**

Wang et al. (2012) broadly divide the possible policy applications of ecosystem accounting into three areas: information that supports monitoring (e.g. of the state and condition of ecosystems of meeting targets, such as the Aichi Targets; or of the impact of economic activities on ecosystems and the services they provide); information that supports specific policies or processes (e.g. decisions relating to land use, water management or climate change mitigation); and information that supports education and awareness-raising (e.g. research or environmental reporting by businesses).

It should be noted that several specific policy applications are expected to be presented in the forthcoming third volume of SEEA Extensions and Applications. This volume aims to provide a bridge between data compilations and analysis by providing guidance on the different possibilities that exist to apply the SEEA CF framework to various policy and research questions. In its current form, a discussion draft, it covers the following four broad topics of SEEA applications:

- 1) analysis of sustainable resource use and environmental efficiency;
- 2) analysis of production, employment and expenditure relating to environmental activities;
- 3) environmental taxes and environmental subsidies and similar transfers; and
- 4) environmental assets, net wealth, income and depletion of resources.

### **Further implementation of the SEEA framework**

An increasing number of both developed and developing countries are compiling or planning to compile environmental accounts using the SEEA CF (e.g., Australia, China, Colombia, Italy, Norway, South Africa and Sweden). Whereas within the EU the focus is more on biophysical flow accounts and monetary accounts (such as environment-related expenditures and taxes), within developing countries the focus is mostly on natural resource (asset) accounting (UNCEEA, 2013). This difference reflects differences in policy priorities. In the EU the focus is on expenditures and resource efficiency, while in the developing world the focus is on resource management, on security issues related to water and energy and on differences in data availability. These differences between countries underline the importance of taking a flexible approach to the implementation of environmental accounting. An implementation strategy for the SEEA CF was developed by the United Nations Committee of Experts on Environmental-Economic Accounting (UNCEEA). The strategy is based on a modular and flexible approach to implementation that recognises the differences between countries (instead of taking a “one-size-fits-all” approach).

<sup>10</sup> There are still outstanding issues complicating the integration of ecosystems within the systems of national accounting. In particular, Edens and Hein (2013) identify four key challenges in the field of ecosystem accounting. They then present a consistent approach to address these.

In other words, not all countries are expected to implement all accounting systems at once. Rather, they are likely to make progress on areas most relevant to their particular needs. The strategy itself is broadly divided into four phases:

- 1) the establishment of an institutional mechanism that drives implementation forward;
- 2) a self-assessment of policy needs and data requirements;
- 3) an assessment of the data quality; and
- 4) the drafting of a strategic development plan for environmental accounting that illustrates the prioritisation of the types of accounts to be developed and an assessment of the data sources required.

As mentioned previously, the SEEA EEA provides conceptual guidance on the state of the art of ecosystem accounting to support experimental implementation where relevant, demanded and possible. Currently, a manual with practical and realistic step-by-step guidance to undertake such experimentation at the national level is being developed by the CBD Secretariat.<sup>11</sup> Given the differing methodologies and country specifications, including differences in data availability, some experimentation using the SEEA EEA can be expected to be driven by national priorities and circumstances. Nonetheless, this experimentation phase is crucial to the further development of the system and should be supported where possible.

Moreover, a recent report by GLOBE International assessed the state and importance of legislation for natural capital accounting. The study highlights the potential role of decision-makers in creating enabling conditions for natural capital accounting and provides a review of the efforts towards natural capital legislation in eight countries. The study also provides recommendations in the form of actions for decision-makers to ensure that natural capital is reflected in national government accounting and policy-making processes. It should be highlighted that these actions include an explicit demand to implement the SEEA CF as a starting point for natural capital accounting (i.e. the SEEA CF and SEEA EEA together).

<sup>11</sup> See page 3 of the opening speech by Bráulio Dias, Executive Secretary of the Convention on Biological Diversity, at the International Conference Global implementation programme for the SEEA, held in New York in June 2013, [http://unstats.un.org/unsd/envaccounting/workshops/SEEA\\_Conf\\_2013/session\\_1/cbd.pdf](http://unstats.un.org/unsd/envaccounting/workshops/SEEA_Conf_2013/session_1/cbd.pdf)



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Reinhardtstraße 18  
10117 Berlin | Germany

Phone: +49 (0)30 311 777 0

Fax: +49 (0)30 311 777 199